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I. *On the Cultivation of Wheat in the Madras Presidency.*

Very little attention seems to have been bestowed upon the cultivation of wheat in the districts of the Madras Presidency, and the total quantity produced appears to be about six hundred garce. Its growth is limited to Mysore and the districts of Guntoor, Nellore, Bellary, Cuddapah, Kurnool, Salem, North Arcot, South Arcot, Coimbatore, and the Hyderabad and Nagpore territories.

In Rajahmundry there is no wheat grown. What is consumed there is brought down from the Deccan by the Binjaries who come to purchase salt.

If it were possible to have the advantages of water carriage on the Godavery, wheat might be imported from the states of Hyderabad and Berar. There are four sorts of wheat grown in the Deccan called yellow bunsee, dawoodkhanee, owradee, and segvalay, and each of these again comprehends three different kinds. The grain is, by no means good, and would not afford a profitable export to England. Considering, however, that no fresh seed has been introduced into the Deccan for, perhaps, centuries, and that the same land has continually been sown with the same description of seed, and that the grain has consequently become deteriorated, it must not be held as an

argument against the power of the lands to produce good and healthy wheat: the first essential to this result being the supply of fresh seed. It is grown in the provinces of Gundapoor, Bheer, Auckeed Puttam, Bathree, Punbunny, Nandair, and Gungakhair, through all of which the Godavery has its course. It is also grown in Balaghat and Payenghat, in Aurungabad, Purindah, and generally in all lands which bear the Rubbee crops, and the cultivation could be increased to any extent along both banks of the river, were a market opened for the produce. It can be produced at a cheap rate, and the Godavery may afford great facilities for its transport.

In Guntoor wheat is cultivated in only four villages in the Prettipaud Talook. The ordinary annual produce is about 50 candies or 2,000 bushels, and is mostly consumed in the district. Wheat crops being hazardous compared with other crops, the ryots are not inclined to extend its cultivation.

Nellore produces but a small quantity, varying from 6,800 lbs. to 2,400 lbs. per annum, grown in the talook of Ongole, not sufficient for the consumption of the district : the rest being brought down by the Binjaries.

In Bellary the total quantity of land fit for wheat cultivation is 14,600 acres ; of which only 4,056 or 28 per cent. are under this tillage. The causes of this are

1st. The insufficiently remunerative profit procurable for this produce.

2d. The prevalence of a disease peculiar to this grain, which is generally attended with loss to the cultivator.

3d. The straw of wheat not being generally used as forage for cattle, and

4th. The greater expense incurred, and labour required, in preparing the soil, and tending this plant to its maturity, and time of harvesting compared with other produce. Wheat raised on a fertile dry soil requires repeated falls of rain (frequently not received) to attain maturity.

Two kinds of wheat are produced in this district *Salakee gothoomah*, and *Java gothoomah*. The former is better, and its flour darker in colour than the latter. The annual produce is estimated at 162 garce, all of which is consumed in the district, together with

293 garce imported from Dharwar. The ordinary bazar price is Rupees 165½ per garce, or about Rupees 1-1-2 per bushel, allowing 9,256½ lbs. to the garce, and 60 lbs. to the bushel. The cost of transport to Madras is on the average Rupees 145 per garce.

The greater part of the land of the Bellary Collectorate cultivated with wheat is black soil mixed with saline ingredients, or black soil of a loamy description. Ploughing is not required, but the land is harrowed from 4 to 8 times according to the ability of the cultivator, and the seed (with the husk) sown by means of the "gorray" which drops it in drills. The remainder (370 acres) is black and mixed soils irrigated by wells: ploughing always required, and the sowing is broad cast. The season for sowing is in September or October; and in 90 days from the time of sprouting (which is in 6 or 7 days) the produce is harvested. The height of crop varies from 18 to 24 inches. Lands in the beds of tanks yield the most remunerative produce, having the advantage of rain water remaining in them. Irrigated lands entail a far greater amount of labour, and expense of time and capital. The cost of conveying a garce of wheat to Madras by bandies would be Rupees 170, and on bullocks Rupees 120.

Cuddapah produces three different qualities of wheat. The first sort in dry black lands; the second in dry lands and in the beds of tanks, and the third in wet lands. The quantity of land under cultivation for wheat is 2,800 acres, producing about 341 garce. The average price at which these three sorts have been sold within the last five years is respectively Rupees 233—204, and 175,—or Rupees 1–8–2,—1–5–2 and 1–2–2 per bushel. The cost for conveyance of a garce to Madras varies from Rupees 96 to 120. The district is not generally favorable to the growth of wheat, but its culture might be greatly improved and extended in the Northern Talooks, in the rich black soils, which already produce wheat of a fair quality, were sufficient inducement held out to the ryots to cultivate this grain in preference to other descriptions of produce; but in the absence of roads to facilitate the transport it holds out no prospect of its becoming an article of export to England.

In Kurnool the poverty and want of enterprize of the people is an obstacle to the extension of wheat cultivation, as also the ex-

pense attending it, its liability to be injured by blight or attacks of insects, the difficulty of storing it, and preserving it from rot or decay unless placed in chunam or fuller's earth, both expensive methods. The total produce of the district for 1256 fusly was 26½ garce, and the price averaged from 213 to 263 Rupees, or Rupees 1-6-2 to 1-11-5 per bushel, the cost of conveyance to Madras being Rupees 140.

Salem produces wheat on the hills of the four Talooks,—Salem, Namcul, Ahtoor, and Tripatoor, in soil chiefly composed of red earth. The cultivators of it are Malialies, and the produce of fusly 1256 amounted to 52 garce. The average price is Rupees 310-15-0 per garce. There are two descriptions of wheat called potty codoomby and javey codoomby: the latter only being cultivated. The cost of conveyance to Madras is Rupees 46 for 2½ cundugums or 50 mercals or 88 Rupees per garce. A certain portion of the quantity produced has always been exported to Madras, Trichinopoly, and Coimbatore. It is doubtful whether larger quantities of it could be profitably cultivated for export, from the expense of carriage. The extent of land under this cultivation is 3,960 acres.

In North and South Arcot the cultivation is carried to an extremely small extent, and there appears no probability of its being extended.

The only part of the Madura district where wheat is cultivated is the Palany hills, and even there to an insignificant extent, the supply required having to be furnished from the Salem district. It is probable, that these hills would produce a considerable quantity of wheat, but the thinness of the population and the difficulty of the passes are great obstacles in the way of exportation.

Coimbatore produces a limited quantity of wheat of two kinds, one the product of the Neilgherries the other of the low country, both of inferior quality. According to the return furnished by the Principal Collector of Coimbatore the quantity raised in fusly 1256 was 4 garce, and its price Rupees 1-12-10 per bushel, but in Captain Ouchterlony's Memoir of the Neilgherries published in our last it will be seen that that gentleman calculates the quantity grown upon the Hills as 3,000 bushels of 68⅗ lbs. to the bushel, or

more than 22 garce. He also gives it as his opinion that these hills "are capable of furnishing for export to Europe from 4 to 500,000 quarters of wheat of a quality far superior to that which is at present raised and at a cost sufficiently low to admit of large profits being realized by the grower, even when the price is so low as 65 shillings the quarter." The Collector is however of opinion that this district can never be made a wheat growing one ; his reasons for forming this opinion are however not stated.

The climate of Madras is unfavourable to its successful cultivation. It grows luxuriantly, and produces seed, in the gardens of the Horticultural Society, but only, when treated with care and attention : for in general a mere empty ear is formed. It is believed that the Shedvaroy Hills, having an elevation of 5,000 feet, and a temperature, during the months of cultivation, of from 52° to 68°, are better adapted for success in this cultivation. Large quantities are grown there for domestic consumption. Probably a much nearer limit may be found in the range of hills 88 miles N. N. W. from Madras, of which Combaconum Droog is the highest, being about 2,250 feet above the level of the sea. Wheat is one of the rubbee or late crops in the vallies of the Kishna and Tumbudra at an elevation of probably not more than 1,800 feet ; the temperature varying from 45° to 80° in the cold weather. In the Caraccas lat. 10° 3′ wheat is successfully cultivated at an elevation of 1,800 feet ; and in the Isle of France lat. 20°, where the temperature rises to 78° and 80° wheat ripens on the coast. If therefore no local causes act unfavourably, the experiment might be made with advantage on Combaconum Droog, the soil, it is said, being favourable. A register of the temperature of these hills would be sufficient to decide the question, as wheat can only be successfully cultivated under a mean temperature of 67° or 68°.

Captain Dobbs, Superintendent of the Chittle Droog division, forwarded to Dr. Wight two samples of wheat, the produce of one of his talooks. It was grown on the black cotton soil common in that part of Mysore. It is stated to be of very good quality but not nearly equal to English grown wheat. The samples were of two kinds, the "flinty" and "soft," the former being more highly charged with gluten than the latter.

Notes on the Influence exercised by Trees on Climate.

In 1847 the Court of Directors sent a despatch to the Supreme Government, requesting the attention of the authorities to the effect of trees on the climate and productiveness of a country or district. On receiving this communication the Madras Government directed a circular to their revenue officers requesting them to forward any of the required information in their power, and several valuable reports have accordingly been received in reply. Three of these having been placed at the disposal of the Literary Society, for publication in their Journal, the first inserted is a paper by Assistant Surgeon Balfour, whose attention having been directed to this subject for many years past, his own observations will be found interspersed with the remarks of different authors, the whole forming a summary of all that is known regarding this very important subject. Our thanks are due to Mr. Balfour for the valuable precis he has given and for the many well authenticated facts he has furnished, and although there is necessarily much in these notes that is speculative, and requiring further investigation, yet, with this paper before them, future inquirers will be able to prosecute their labours with all the exactness that a scientific inquiry of such vast importance to India, demands. That the subject will now be fully investigated there can be no doubt, for besides an interesting letter received from Surgeon Smith, a very important one has also been received from General Cullen, whose well known scientific character is sufficiently appreciated to ensure the attentive perusal of any remarks that proceed from his pen. General Cullen's observations and the report by Surgeon C. J. Smith of the Mysore Commission, likewise appear in this number of the Journal.

EDS.

Revenue Department.

No. 981.

Extract from the Minutes of Consultation under date the 8th September, 1848.

Read the following letter from Assistant Surgeon Edward Balfour.

From Assistant Surgeon Edward Balfour, *Madras Army.*

To The Secretary to Government.

Sir,—In the *Madras Spectator* of the 13th Instant it is mentioned that a despatch from the Court of Directors had reached the Supreme Government and been communicated to the Government of Madras on the subject of the effect produced by the presence of trees, whether as natural wood or the result of arboriculture, upon the climate and productiveness of any country, but more especially of India.

2d. A remark in one of Dr. Priestly's writings had directed my attention to the influence of trees on the health of man, and in the course of my inquiries, some years ago, I think in 1840, I arranged a few notes which I had collected on a collateral subject, viz.: the influence of trees in inducing rain and preserving moisture.

3d. These notes were published as an editorial article, to which the Editor prefixed the following paragraph.

"The following precis on the value and advantages of trees, their causing rain to fall in the districts where they grow, &c. will no doubt be read with pleasure by those who take an interest in the agricultural prosperity of India. The subject is one of great and general interest in any country, but, more particularly so in a country like this, where irrigation is of such paramount importance, involving the comfort and even existence of millions of our fellow creatures."

4th. This commendatory paragraph from the scientific and learned Editor makes me hope, that, at this time, when information is sought for, these notes may be accepted by the Government and may be deemed not unworthy of being added, or of forming a preamble to the information which they may be able to collect from other servants of this presidency.

I have the honor to be, &c.

Kurnool,
31*st March*, 1848.

Edward Balfour, Asst. Surgn.
Madras Army.

II. *Notes on the Influence exercised by Trees in inducing Rain and preserving Moisture : arranged by Assistant Surgeon* Edward Balfour, *Madras Army.*

With the exception of a few localities in Southern India the whole country seems destitute of trees. Whether they have disappeared under the hands of man while none were planted to supply their places, or whether they never existed, nothing so much strikes the attention as their general scarcity.

Having passed over a large part of the peninsula this bareness reminded me of the great influence that trees are believed to exercise on the composition of the atmosphere and on the quantity of water that falls on the earth's surface, and impressed with the belief that no small benefit would accrue to the country, and to the Government, were trees planted in particular localities, along roads and on lands which from their height or other causes cannot be brought under cultivation, I thought it might be useful to arrange the meteorological facts bearing on this point that have been recorded by different observers ; for if a candid examination of these facts lead us to acknowledge their correctness, we cannot but look upon the cultivation of trees as of vital importance in such a country as India, where, under a tropical sun, the atmosphere is so likely to become loaded with miasmata and the fertility of the land is so much dependent on the supply of water.

Aware of the great falls of rain, which in several parts of India amount to 120 inches during the year, it might at first sight appear inexplicable to us when informed of the very limited quantity that other places receive ; and, amongst others, " that less rain falls at Bellary than at any other place in Southern India, for during the year 1838 only 11¼ inches fell." But our surprise diminishes on learning " that towards the centre of the Ceded Districts the surface of the plain presents a monotonous and almost treeless aspect bounded by the horizon, and unbroken save by a few rocky elevations that stand forth abruptly from the sheet of black soil like rocks from the ocean. The country from Bellary to Tarputtry and from Pennacoondah, Ghooty and Adoni to the Kistnah is much of a similar nature. Sir Thomas Munro might

well observe that these districts are more destitute of trees than any part of Scotland he ever saw, and that the traveller scarcely meets with one in fifty miles and no where with a clump of fifty.* In Bellary the heat and glare are excessive.

Incidental remarks are met with in the writings of many authors showing how closely, from their observations, the purity, humidity and temperature of the atmosphere, and the supply of water on the earth's surface depend on the foliage of trees; and, indeed, I would have hesitated to have thrown these few notes together were the facts less numerous than we find them, or in any way doubtful, but we can form from many of them no other conclusion than that the abundant or scanty supply of rain depends on the number or scarcity of trees, and that the quantity of rain which falls alters as the trees are diminished or increased.

All who have travelled over a bare sandy tract in a tropical country and breathed the dry irritating air lying over it must remember the great relief experienced on gaining the shade of a clump of trees or even of a solitary tree, and it is easy for such travellers to understand the beneficial effect that the cooler air, there, must exert on the neighbouring vegetation.

Alluding to the unhealthiness of Hong Kong, Fortune, in his "Wanderings"† remarks that his own observations had led him to the following conclusions. Much of the sickness and mortality doubtless proceeded from the imperfect construction and dampness of the houses in which our people were obliged to live when the colony was first formed, and a great deal may be also attributed to the fierce and burning rays of the Hong Kong sun. All the travellers in the East with whom I had any conversation on the subject agreed that there was a fierceness and oppressiveness in the sun's rays, here, which they never experienced in any other parts of the tropics, even under the line; I have no doubt that this is caused by the want of luxuriant vegetation and the consequent reflection of the sun's rays. The bare and barren rocks and soil reflect every ray that strikes them; there are no trees or bushes to afford shade or to decompose the carbonic acid and ren-

* Captain Newbold in Madras Journal of Literature and Science, No. 24, p. 122.

† Fortune's Wanderings in China, 1847, p. 26.

der it fit for the respiration of man, and thus the air wants that peculiar softness which makes it so equable even in hot tropical climates.

If these are the principal causes of the mortality in our new colony the remedy will of course be apparent to every one. Already a great improvement has taken place in the houses of the merchants and in the barracks of the soldiers, and the results have been most satisfactory. But the colonists must not stop in this stage of their improvements. Let the Governor and the inhabitants use every means in their power to clothe the hill sides in and around the town with a healthy vegetation: let them plant trees and shrubs by the road sides, in gardens and in every place available for such purposes, and, then, I have no doubt, that Victoria will be quite as healthy as Macao. No one can approve of the selection of Hong Kong as a British settlement, but that part of the business being irremediable we must make the most of our bargain."

But perhaps no one, more beautifully than Humboldt, describes the arid dryness which the aspect of a tropical country presents when destitute of vegetation. After a descent of 1,000 feet from the valleys of Aragua had brought the travellers towards the Oronoko they "entered the basin of the Llanos in the Mesa de Paja in the 9th degree of latitude. The sun was almost at the zenith; the earth wherever it appeared sterile and destitute of vegetation was at the temperature of 48° or 50°. Not a breath of air was felt, yet, in the midst of this apparent calm, whirls of dust incessantly arose. All around us, says Humboldt, the plains seemed to ascend toward the sky and that vast and profound solitude appeared to our eyes like an ocean covered with sea-weeds. The earth there was confounded with the sky, through the dry fog and strata of vapour, the trunks of palm trees were seen from afar; stripped of their foliage and their verdant summits, these trunks appeared like the masts of a ship discovered at the horizon.

There is something awful but sad and gloomy in the uniform aspect of these steppes. Every thing seems motionless; scarcely does a small cloud as it passes across the zenith and announces the approach of the rainy season, sometimes cast its shadow on

the Savannah. I know not whether the first aspect of the Llanos excites less astonishment than that of the chain of the Andes. It is impossible to cross these burning plains without inquiring whether they have always been in the same state: or whether they have been stripped of their vegetation by some revolution of nature. The natives believe that the palmares and the chaparales, (the little groves of palm trees and rhopala) were more frequent and more extensive before the arrival of the Spaniards. Since the Llanos have been inhabited and peopled with cattle, become wild, the Savannah is often set on fire to meliorate the pasturage, and groups of scattered trees beneath the shade of which vegetation enjoyed a protection from the scorching rays of the sun, are accidentally destroyed.*

St. Pierre tries to explain the mode in which trees temper the heat of tropical countries. One day in summer, he says, about the hour of two in the afternoon, being about to cross the forest of Ivry, I observed some shepherds with their flocks, who kept at a distance from it, reclining under the shade of the trees scattered over the country. I asked why they did not go into the forest, to shelter themselves and their flocks from the heat of the sun. They told me it was then too hot there and that they never drove their sheep thither but in the morning and evening. Being desirous, however, of traversing in broad day, the forest in which Henry IV. had hunted and of arriving betimes at Anet to view the country residence of Henry II. and the tomb of his mistress, Diana de Poictiers, I engaged a boy belonging to one of the shepherds to accompany me as a guide, which was a very easy matter to him as the road to Anet crosses the forest in a straight line and it is so little frequented that I found it covered in many places with grass and strawberry plants. I felt all the time I was walking a suffocating heat and much more intense than that experienced in the open country. I did not begin to breathe freely till I was quite clear of the forest and had proceeded more than three musket shots from its skirts.

I have since reflected on what the shepherds told me concerning the heat of the wood, and, on my own experience of the truth

* Personal Narrative, vol. iv., p. 291, et sequent.

of their information, and I have, in fact, remarked, that in spring, all the plants are more forward in the vicinity of woods and that violets are found in flower on their borders much earlier than in the open plain or on the naked hill. The forests, therefore, protect the ground from the cold in the north, but what is not a little wonderful, they shelter it from the heat in warm climates. These two opposite effects proceed only from the different forms and dispositions of their foliage. In the north the leaves of the pine, the larch, the fir, the cedar, and the juniper are slender, glossy and varnished; from their smallness, their polish, and the variety of their directions they reflect the heat around them in a thousand ways producing nearly the same effect as the hair of the animals of the north whose furs are warmer in proportion as their hair is more fine and glossy. Besides, the leaves of several species, as the fir and the birch, are suspended perpendicularly from their branches by long moveable stalks, so that with the least breath of wind, they reflect around them the rays of the sun, like mirrors. In the south, on the contrary, the palm, the talipot, the cocoa and the banana bear large leaves which on the side towards the ground are rather dull than glossy, and which extending horizontally, throw a broad shade beneath them, without any reflection of heat; I admit, nevertheless, that the clearing away of forests dispels the cold arising from humidity, but it increases the dry and piercing cold of the north, as experience has proved on the lofty mountains of Norway which were formerly cultivated, but are now uninhabitable because they have been totally stripped of their woods. This clearing of the ground likewise increases the heat in warm countries, as I have observed in the Isle of France on several hills, which, since all the trees have been destroyed, are become so dry as to be at present incapable of cultivation. The grass which grows on them during the rainy seasons, is in a short time burned by the sun. What is still worse, in consequence of the aridity of these hills a great number of streams are dried up: for trees planted on eminences attract the humidity of the air and fix it there, as we shall see in the study that treats of plants. Besides, by destroying the trees which are on high grounds, the vallies are deprived of their natural manures, and the plains of the skreens which shelter them from the high winds. These are in some

places so destructive to cultivation, that nothing can be made to grow upon them. It is to this cause that I ascribe the sterility of the heaths of Brittany. In vain have attempts been made to restore them to their former fertility, they will never succeed, unless we begin with restoring to them their shelter and their temperature by replanting their forests.*

This effect of trees in mitigating the intensity of tropical heat has also been alluded to by the present superintendent of forests in our western presidency, who mentions that in the southern districts of Guzerat the vicinity of the sea and the proximity of the mountain tracts covered with jungle tend to render the climate more mild and the temperature throughout the year, more equable, than is the case in the other parts of the province. Farther inland and in the immediate vicinity of the hills the heat is greater, and in both situations the humid and loaded atmosphere in the S. W. monsoon, is often painfully felt particularly at night. In the whole of this district rain falls in greater quantities than to the northward; in the jungle districts to the east, the supply of rain is said never to fail in the driest of seasons and it often falls there when none is apparent in the more open districts.

It is in such tracts as these that rivers rise, for from the number, height, and comparative proximity of the hills, to the southward of the Taptee, we might a priori suppose that the supply of water in that district would be abundant : and such is actually the case as we find in a breadth of 50 miles, eight rivers, all containing water throughout the year. Reasoning from these facts we may also predicate the sort of country in which these rivers have their origin, viz., under-lying hilly tracts abounding in rich soil, highly retentive of moisture and rendered still more so by luxuriant jungle.†

An instance of the quantity of rain increasing from trees being planted is mentioned in a work, very recently published in St. Helena, in which it is recorded that the quantity of rain which falls on that island has greatly increased within the last fifty years. The writer, after remarking that the past year (1847) may be considered a good one for the farm and garden, notwith-

* St. Pierre's Studies of Nature, vol. i., p. 223, ed. 1846.

† Surgeon Gibson in Tr. Bomb. Med. and Phys. Soc. Journal, p. 37 and p. 4.

standing the severity and length of the winter, thus continues; indeed in some parts of the island, the crops in particular have been remarkably good, having had plenty of rain at the proper season. By comparing with each other the quantities of rain which have fallen during the last seven years, it will be seen how greatly the amount varies from year to year. Many years must therefore elapse before sufficient data can be obtained from which to deduce a correct average of the annual amount. The quantity is perhaps double of what it was in the beginning of the present century. The cause of this increase is doubtless the plantations of trees which have been formed since that period on the high grounds. These plantations appear to have performed another piece of good service to the island. Formerly heavy floods caused by sudden torrents of rain, were almost periodical and often very destructive. For the last nine or ten years none have occurred. If the cause of these rains was electrical disturbance, the trees may, by their conducting powers, have controlled the tendency.*

If possessed of the foregoing information, alone, doubts might arise as to whether the extent of vegetation in such countries were not rather the consequence than the cause of the abundance of water, but the observations of other scientific men support the belief that a mutual reaction goes on between these two physical agents, and that the presence of trees greatly adds to the supply of water and feeds the running streams; and that so soon as man, to supply his wants, has thinned or removed the trees which clothe the hill sides of the district he inhabits, the rain diminishes or rapidly runs off, its rivers dry up, and the previous fertility of its lands completely disappears. As an instance of the consequence of the hill sides being denuded, an intelligent officer has stated that when he first went to Dapoolie, the hills were clothed with trees and shrubs; they now show nothing but bare rock and earth black and red. The climate is, now, considerably hotter and drier, and streams which then ran in May are now dried up in December.†

Humboldt after leaving the town of Caraccas remarks that ma-

* St. Helena Almanac, 1848, p. 5.

† Surgeon Duncan in *Bombay Times*, 1839.

ny of the mountains of that name enter the region of the clouds, but the strata of primitive rocks dip at an angle of 70° or 80° and generally toward the north-west. In the interior of the province we meet with spaces of land two or three leagues square, quite destitute of springs. The sugar cane, indigo and coffee can grow only in places where running waters can be made to supply the artificial irrigations necessary during very dry weather. The first colonists very imprudently destroyed the forests. Evaporation is enormous on stony soil surrounded with rocks that radiate heat on every side. In the eighth and tenth degree of latitude, in regions where the clouds do not glide along the soil, many trees are stripped of their leaves in the months of January and February, not on account of the sinking of the temperature as in Europe, but because the air at this season, the farthest from that of rains, has nearly attained its maximum of dryness. The plants with very tough and glossy leaves alone resist this absence of humidity. Beneath the fine sky of the tropics the traveller is struck with the aspect, almost hibernal, of the country: but the freshest verdure again appears, when he has reached the banks of the Oronoko where another climate prevails, and the great forests preserve by their shade, a certain quantity of moisture in the soil which they shelter from the devouring ardour of the sun.*

By felling the trees, that cover the tops and sides of the mountains, men in every climate prepare at once two calamities for future generations; the want of fuel and a scarcity of water. Trees by the nature of their perspiration and the radiation from their leaves in a sky without clouds, surround themselves with an atmosphere constantly cold and misty. They affect the copiousness of springs, not, as was long believed by a peculiar attraction for the vapors diffused through the air, but, because, by sheltering the soil from the direct action of the sun they diminish the evaporation of the water produced by rain. When forests are destroyed, as they are every where in America by the European planters with an imprudent precipitation, the springs are entirely dried up or become less abundant. The beds of the rivers remaining dry during a part of the year, are converted into torrents whenever great rains fall on the heights. The sward and moss disappear-

* Personal Narrative, vol. iv., p. 62.

ing with the brushwood from the sides of the mountains, the waters falling in rain are no longer impeded in their course; and instead of slowly augmenting the level of the rivers by progressive filtration, they furrow during heavy showers the sides of the hills, bear down the loosened soil, and form those sudden inundations that devastate the country. Hence it results that the destruction of forests, the want of permanent springs, and the existence of torrents, are three phenomena closely connected together.*

In the collectorate comprizing the South Conkan, under Bombay, since this tract has been denuded of forest as it now has, from the pressure of population, to a great extent been, all the inhabitants concur in asserting that the springs have left the uplands, that the climate has become greatly drier, the seasons more uncertain and the land less fertile. I believe that this can be confirmed by the testimony of the late Collector Mr. Elphinstone, but indeed it is most apparent to a person travelling along that line of country, as I have just now been doing, mainly with the intention of remarking changes which have taken place in the interval of fifteen years, which period of time has elapsed since I visited that line of country before; I have also understood that effects of a similar kind have been experienced at the Neilgherry Hills. A change of climate similar to that, now, under contemplation is by no means limited in extent to the mere district in which the clearing has taken place, but its influence extends far inland. Take for example all the southern and western portion of the Dharwar Zillah. This fertile country abounds in moisture in so much that it has been, (though rather inaptly I think) compared to the valley of the Mississippi: at all events American upland cotton grows there which it will hardly do in other parts of the Bombay Presidency. I think it is not too much to say that much of this moisture depends on the wooded country forming its western border, and that with the complete removal of this the climate would greatly change. My own opinion is that in the Bombay Presidency some cause of this kind has had a great share in producing that irregularity of the rainy season which has of late years been so much complained

* Personal Narrative, vol. iv., p. 143.

of, as to diminished fertility of the soil from the removal of belts of wooded country; the rationale of this is most evident.*

The climate of Rio de Janiero has been very much modified by the clearing away of the forests in the neighbourhood. Previous to this the seasons could scarcely be divided into wet and dry as they are at present. Then rain fell nearly all the year round, and thunder storms were not only more frequent but more violent. So much has the moisture been reduced that the supply of water for the city has been considerably diminished, and the Government has in consequence forbidden the further destruction of the forests." Gardner's Travels in Brazils.

Another author remarks that the whole of the eastern front of the range (of mountains in Penang) has within a few years been denuded of its forests, and representations have been often made to the local authorities at Penang, urging the necessity of reserving the jungles, on the summits and higher slopes, but hitherto without effect. * * * But climate concerns the whole community and its protection from injury is one of the duties of Government. In Germany and France there are special laws and departments for the preservation and extension of forests.

It is not necessary to cite Humboldt or Boussingault to prove the great influence in tropical regions of forests, and, especially, of mountain forests, in attracting and condensing clouds, diminishing local temperature and increasing humidity. But if the forests had no other effect than to protect the clay soil of the mountains from the action of the sun's rays this alone ought to be sufficient to ensure their careful preservation. It is in this soil that the waters which supply all the streams of the island, and which percolate downward to the lower lands, are enclosed. These mountains are in fact great natural reservoirs, elevated in mid air and exposing the most extended surfaces possible, which are covered to a small depth with a sponge of porous decomposed rock for the absorption and retention of water. In ordinary seasons, when there is a considerable fall of rain, the importance of preventing the contents of these reservoirs from being dissipated may not be so obvious. But it may now be considered as a well established fact that the eastern Archipelago is subject to periodical droughts, although the

* Report from Dr. Gibson, dated 9th March, 1846.

laws of their recurrence are not yet ascertained. That such droughts, will again happen and are in fact in the settled course of nature admits of no question.

Nature when left to herself provides a compensatory influence in the dense leafy forests but if these are consigned to destruction every successive drought will prove more baneful than the preceding. Unless Government will reserve at least the steeper mountain tracts which are not adapted for permanent culture there is nothing visionary in the apprehension, for it has been realized in other localities, that in some prolonged drought after the naked sides of the hills have been exposed for a few weeks to the direct heat of the sun every stream in the island will be dried up and universal aridity ensue. The great extent to which the plain of the mainland of Penang has been shorn of its forests, would of itself produce an urgent necessity for a stop being at once put to a war with nature, which must entail severe calamities on the future. In those mountains in Greece which have been deprived of their forests the springs have disappeared. In other parts of the globe the same consequence has followed. The sultry atmosphere and dreadful droughts of the Cape de Verde Islands are owing to the destruction of the forests. In large districts in India climate and vegetation have rapidly deteriorated from a similar cause, and the Government having become fully impressed with the necessity of respecting the stubborn facts of nature every means have been used to arrest and remedy the mischief. Forests which had been so easily and thoughtlessly cut down have at great cost been restored.*

The above remarks having been obtained from the writings of men whose lives have been devoted to the study of nature and her works, and the facts adduced having been drawn from the greater portion of our globe, it appears impossible that any one could rise from their perusal without acknowledging that there is a general belief entertained that it is to the abundance or scarcity of trees to which we must attribute the copious or scanty supply of rain, and the tempering, in the tropics, of the fierceness of the solar rays. While this general belief, therefore, must be acknowledged, and the fact itself, perhaps, admitted, it may, nevertheless, be as

* Journal of the Indian Archipelago, vol. ii. p. 534.

yet impossible to explain the mode in which trees and forests thus exercise their influence. From the writings of the authors above quoted it would seem as if several agencies were at work, and that independent of the supposed electric action which the mountain forests give rise to and of the attracting and condensing apparatus which their leaves are likened to, they produce a spongy tenacious under-soil which they protect from the drying effect of the winds and sun's rays, and by this means cause the rain that falls to trickle slowly to the lower lands and keep up a constant supply of water in the streams; and it will have been evident also that the trees which clothe the mountain summits are regarded by other authors, as a vast condensing apparatus placed by nature on the elevated parts of the earth to distil the waters of the clouds which so constantly enshroud their heights. While we are as yet only learning the laws that regulate the development of electricity, and its action on the surrounding atmosphere we know how great an influence it exercises on vegetation, and it is not impossible that mountain forests will ultimately be proved to be great electric forces placed by nature for the purpose of promoting the fall of rain. The most agreeable of the writers on this subject is St. Pierre who traces in every forest, tree, and shrub, and in every leaf and branch evidence of wise and beneficent design, which he beautifully alludes to when describing "the elementary harmonies of plants with the water and the air by means of their leaves and of their fruits."*

When the author of nature resolved to crown with vegetables even the highest pinnacles of the earth, he first adapted the chains of the mountains to the basins of the seas, which were to supply them with vapors; to the courses of the winds which were to waft them thither, and to the different aspects of the sun from which they were to receive warmth. As soon as these harmonies were established between the elements, the clouds ascended from the ocean and dispersed over the most remote parts of the continents. They there diffused themselves in a thousand different forms, in fogs, in dews, in rains, in snows, in frosts. They distilled from the upper regions of the atmosphere in manners equally various; some in a calm air, like our spring showers, fell in perpen-

* St. Pierre, Studies of Nature. London, 1846, vol. ii p. 23.

dicular drops, as if they had been poured through a sieve; others driven by violent winds, were hurled horizontally against the sides of the hills: others descended in torrents, like those which, nine months in the year inundate the island of Gorgona, situated in the heart of the torrid zone in the burning gulf of Panama. Some piled themselves in mountains of snow on the inaccessible summits of the Andes to cool by their waters the continent of South America and by their frigid atmosphere the vast Pacific Ocean. Lastly, mighty rivers flowed through regions in which it never rains and the Nile watered the plains of Egypt.

God then said "Let the earth bring forth grass, the herb yielding seed, and the fruit tree yielding fruit after his kind, whose seed is in itself upon the earth." At the words of the Almighty the vegetables appeared with organs fitted to collect the blessings of heaven. The elm arose on the mountains that skirt the Tanais covered with leaves in the form of a tongue: the tufted box issued from the brow of the alps; and the thorny caper tree from the rocks of Africa, with leaves scooped out into spoons. The pines of the sandy mountains of Norway attracted the vapors floating in the air with their taper foliage, arranged like a hair pencil: the verbascum extended its broad leaves over the parched sands; and the fern presented on the hills, its fan shaped foliage to the rainy and horizontal winds. A multitude of other plants from the bosom of the rock, from beds of flint, nay even from marble incrustations, received the waters of heaven in cornets, in cups, in cruets. From the cedar of Lebanon to the violet that skirts the grove there was not one but what presented its ample bowl, or its diminutive cup, conformably to its necessities or its situation.

This adaptation of the leaves of the plants of elevated situations to receive the rain, is varied without end, but their character is in general perceptible not only in their concave forms, but likewise in a small hollow channel on the stalk by which they adhere to the branches. It is somewhat similar to that which nature has traced on the upper lip of man to receive the humours which descend from the brain. It may be observed in particular on the leaves of thistles, which delight in dry and sandy situations. They have besides collateral awnings to prevent the loss of any portion

of the water that falls from heaven; plants which grow in very hot and very dry situations sometimes have the entire stem and leaf transformed into a channel; such is the aloe of the island of Socotora at the entrance of the Red Sea or the prickly taper of the torrid zone. The aqueduct of the former is horizontal, and that of the latter perpendicular.

What has prevented botanists from remarking the relations that exist between the leaves of plants and the waters by which they are refreshed is that they see them every where nearly of the same form, in the vallies as on the eminences: but though the mountain plants exhibit foliage of every species of configuration it may be easily perceived from their aggregation in the form of hair pencils or of fans, from the contraction of the leaves or other equivalent marks, but principally from the aqueduct which I have just mentioned, that they are intended to receive the rain water. This aqueduct is traced on the stalk of the smallest leaves of mountain plants; it is by means of it that nature has rendered even the forms of aquatic plants susceptible of vegetation in the most parched situations. The reed for example, which is only a round full pipe that grows by the water-side, appears incapable of collecting any humidity in the air though it is well adapted to elevated situations by its capillacious form which like that of gramineous plants, presents nothing which the wind can lay hold of. In fact if you examine the different species of the rush that clothe the mountains in various parts of the world, such as that called *icho*, on the lofty mountains of Peru, which is the only vegetable that grows on some parts of them, and those that thrive in our climates in parched sands or on eminences, you would, at first sight, believe them to be similar to the rush of the marshes: but a little attention will enable you to observe, not without astonishment, that they are hollowed into a gutter throughout their whole length. Like other rushes, they are convex on one side: but they differ from them essentially in being concave on the other. By this character I discovered the spart, which is a rush of the mountains of Spain and is now employed at Paris to make cordage for draw wells.

The leaves of many plants, even in the plains, assume on their first appearance this form of a gutter or spoon, as those of the

violet and of most gramineous plants. In the spring you may perceive the young tufts of the latter raising themselves up towards heaven like claws to catch the drops, especially when it begins to rain: but most of the plants of the plains lose the gutter as they expand. It was given them only for the season necessary to their growth. It is permanent only in the plants of the mountains. It is scooped out as I have observed on the stalks of leaves, and in trees conducts the rain water from the leaf to the branch; the branch by the obliquity of its position conveys it to the trunk whence it descends to the root by a series of consequent dispositions. If you pour water gently over those leaves of a mountain shrub which are the most remote from its stem, you will observe it run off by the track which I have indicated and not a single drop will fall to the ground. I had the curiosity to measure in some mountain plants the inclination formed by their branches with their stems and I found in a dozen different species, as in the fern, the thuia, and others, an angle of about thirty degrees. It is exceedingly remarkable that this degree of incidence is the same as that formed in a horizontal plane by the course of many small rivers and rivulets, with the streams into which they discharge themselves as may be ascertained upon the maps. This degree of incidence seems to be the most favorable to the efflux of various fluids which direct themselves towards a single line. The same wisdom has regulated the level of branches in trees and the course of rivulets in plains. This inclination is subject to some varieties in several mountain trees. The cedar of Lebanon, for example, shoots the lower parts of its branches towards heaven, and bends the extremity downward toward the earth. They have the attitude of command which is suitable to the king of vegetables, that of an uplifted arm, the hand of which is inclined. By means of the first disposition the rain water is conveyed towards the trunk, and the second the snows, in the regions of which it delights glide from its foliage. Its cones have likewise two different positions, for it first bends them towards the ground, to shelter them at the season of flowering; but when they are fecundated it raises them up towards heaven. The truth of these observations may be confirmed by a young and beautiful cedar in the garden of plants at Paris, which though an exotic has preserved in our climate the attitude of a king, and the costume of Lebanon.

The bark of most mountain-trees is in like manner adapted to convey the rain water from the branches to the roots. That of the pine is in large perpendicular ridges; that of the elm is split and cleft longitudinally; that of the cypress is spungy like tow.

The plants of mountains and of dry situations have farther a character which is peculiar to them, in general, it is that of attracting the water which floats in the air in imperceptible vapors. The parietaria, or pellitory, which has derived its name "*a pariete*" because it grows on the sides of walls, has its leaves almost always humid. This attraction is common to most of the mountain-trees. All travellers agree in asserting that in the mountains of Ferro, one of the Canary Islands, there is a tree which every day furnishes that island with a prodigious quantity of water. The natives call it *garoe* and the Spaniards *santo* on account of its utility. They tell us that it is always surrounded with a cloud which distils abundantly down its leaves, and replenishes with water capacious reservoirs which are constructed at the foot of the tree, and afford a copious supply to the island. This effect is probably somewhat exaggerated, though reported by persons of different nations, but I give credit to the general fact. The real state of the case I take to be this, that the mountain attracts from afar the vapors of the atmosphere and the tree being situated in the focus of that attraction collects them around it.

Having frequently spoken in the course of this work of the attraction of the summits of different mountains the reader will not be displeased if I here present him with an idea of this portion of the hydraulic architecture of nature. Among a great number of curious examples which I could adduce and which I have collected among my materials on the subject of geography, I shall quote one extracted not from a systematic philosopher but from a simple and sprightly traveller of the last century, who relates things as he saw them, and without deducting from them any consequences whatever. It is a description of the peaks of the Isle of Bourbon situated in the Indian Ocean in the 21st degree of south latitude. It was drawn up from the papers of M. de Villers, who was then Governor of the island under the East

India Company. It is printed in the narrative of the voyage performed for the first time by French ships to Arabia Felix about the year 1709, and was published by M. de la Roque. 'Among those plains which are on the mountains of Bourbon,' says M. de Villers, the most remarkable, though no account has yet been given of it, is that which has been denominated the plain of the Caffres. In this plain there are a great number of aspen trees which are always green, the other trees have a moss more than a fathom in length, which covers their trunks and their large branches. They are dead, without foliage, and so impregnated with water, that it is almost impossible to make a fire with them. If with great difficulty you at length kindle some of the boughs, the fire is black without flame, yielding a reddish smoke, which spoils meat instead of dressing it; you can scarcely find in the whole plain a single spot where you can make a fire unless you choose some elevation near the peaks; for the soil of the plain is so humid that the water every where gushes out and you are continually in mud and wet up to the calf of the leg. * * * But from the thick fog which surrounds these peaks, from their continual haze, which wets as much as rain and which falls during the night, it is evident that they attract the vapors which the sun raises by day from the sea and which disappear by night. Hence is formed the sheet of water which inundates the plain of the Caffres, and from which issue most of the rivers and streams that water the island. A vegetable attraction is likewise perceptible in those ever-green aspens and trees constantly humid, with which it is impossible to kindle a fire. The island of Bourbon is nearly circular and rises out of the sea like the half of an orange. On the most elevated part of this hemisphere are situated the plain of Silaos and that of the Caffres, where nature has placed that labyrinth of peaks incessantly shrouded in fogs, planted like nine pins and lofty as towers.

If time and space permitted, I could demonstrate that there are a multitude of similar peaks on the chains of lofty mountains, of the Cordilleras, of Taurus and others, and in the centre of most islands, without the possibility of supposing, conformably to the received opinion, that they are the remains of a primitive earth which was raised to that height, for as we have before asked, what

could have become of the wreck of that earth the pretended evidences of which rise on every side upon the surface of the globe. I could make it evident that they are placed there in aggregations and situations adapted to the necessities of the earth, of which they are in some measure the reservoirs, some in the form of a labyrinth like those of the island of Bourbon, when they are on the summit of a hemisphere, whence they are destined to distribute the waters of heaven in every direction; others in the form of a comb, when they are placed on the lengthened crest of a chain of mountains, like the peaks of Taurus and of the Cordilleras; others grouped two or three together according to the configuration of the districts they water. They are of various forms and of different constructions, some are covered with earth, as those of the plain of the Caffres, and some of the Antilles islands, and which are at the same time so steep as to be inaccessible. These incrustations of earth prove that they have both fossil and hydraulic attractions.

There are others which are long needles of solid and naked rock; others are conical, or in the form of a table like the Table Mountain at the Cape of Good Hope, on which you may frequently see the clouds accumulate and spread out in the form of a table cloth. Others are not apparent but are entirely enveloped in the sides of mountains or in the bosoms of plains. All are distinguishable by the fogs which they attract about them and by the streams which flow in their vicinity. We may even rest assured that there exists not a single stream in the neighbourhood of which there is not some quarry of hydro-attractive and most commonly metallic stone. I ascribe the attraction of these peaks to the vitreous and metallic substances of which they are composed. I am persuaded that it would be possible to imitate this architecture of nature, and by means of the attraction of these stones to form fountains in the most parched situations. In general vitreous bodies and stones susceptible of polish are highly proper for this purpose; for when water is diffused in great quantity through the air, as at the time of a thaw, it is first attracted and adheres to the glasses and polished stone in our houses.

I have frequently observed on the summits of the mountains of the Isle of France effects similar to those of the peaks of the plain

of the Caffres in the Island of Bourbon. The clouds are incessantly collected around their peaks which are steep, and pointed like pyramids: some of these peaks are surmounted with a rock of a cubical form which crowns them like a capital, such is that which is there called Piterbooth after a Dutch admiral of that name: it is one of the highest in the island.

These peaks are formed of a solid rock, vitrifiable and mixed with copper; they are real electrical needles, both from their form and their substance. The clouds deviate perceptibly from their course to collect round them and sometimes accumulate in such great quantity, as to shroud them from the view. Thence they descend to the bottom of the vallies along the skirts of the forests, which likewise attract them, and there they dissolve into rain, frequently forming rainbows on the verdure of the trees. This vegetable attraction of the forests of this island so perfectly accords with the metallic attraction of the peaks of the mountains that a field situated in an open place in their vicinity, often suffers from the drought, while it is raining the whole year round in the woods at the distance of less than a musket-shot. By destroying part of the trees that crowned the eminences of that island, most of the streams which watered it were dried up: of these nothing now remains but the empty channels. To the same injudicious management, I ascribe the perceptible diminution of the rivers and streams in a great portion of Europe, as may be seen by their ancient beds, which are much too wide and deep for the volume of water they now contain. Nay, I am persuaded that to this cause must be ascribed the drought in the elevated provinces of Asia, among others in those of Persia, the mountains of which were, without doubt, imprudently stripped of trees by the first inhabitants. I am of opinion that if mountain trees were planted in France on the eminences and at the sources of our rivers, their ancient volume of water might be restored and many streams which have ceased to flow, would again appear in our fields. It is not among the reeds, nor in the depths of vallies, that the Naiads conceal their everlasting urns, according to the representations of painters, but on the summits of rocks, crowned with groves, and near to the heavens.*

* Ibid, p. 242.

Although the complete proof of the subject now under discussion is of great importance to India and other tropical countries it must be allowed that further and more exact investigation will be required before the correctness of the foregoing statements be fully established. But as it is of consequence for the success of future inquirers to collect the existing information from the numerous works through which we find it scattered, I have purposely selected all that I remember to have met with in the course of my readings for insertion here.

Humboldt and St. Pierre must be regarded as valuable authorities, but there is also very concise information on this interesting subject to be found in a memoir by M. Boussingault, concerning "the effects which the clearing of land has in diminishing the quantity of water in the streams of the district."* Whether the labours of the agriculturist are effecting any modification in the climates of the countries subjected to their agency is an interesting question which is now very generally canvassed. It is moreover inquired, whether the immense clearing away of woods in some districts, together with the draining of morasses which exert so much sway over the distribution of heat during the various seasons of the year exert likewise an influence upon the streams and rivers which water the district, either by diminishing the quantity of water which falls, or by inducing a more rapid evaporation from the surface, when the wide spreading forests has been laid low, and its place been supplied by well cultivated fields.

A variety of observations would indicate that such a change has been, and is being, effected. In many localities it has been thought manifest, that, for a certain number of years, the streams which were employed in propelling water wheels have very sensibly diminished. In other places, many have been led to conclude that the rivers have become more shallow; and the increasing extent of their beds, covered with pebbles on either side appear to attest the disappearance of a portion of their waters. Finally many abundant springs are now almost dry. These observations have principally been made in valleys which are surrounded by mountains; and it has been thought apparent, that this diminution in the quantity of the waters, has been nearly coincident

* Jameson's Edin. Phil. Journal, p. 85, vol. xxiv., 1838.

with the epoch when the hatchet was employed, without mercy or judgment, against the woods which were widely distributed over the surface of the country.

These facts seem to indicate that in those regions where the process of clearing has been extensively carried forward, less rain falls than formerly. This in truth is the opinion which most generally prevails upon the point, and if admitted without further examination we must necessarily yield to the conclusion that the clearing away of the forests diminishes the annual quantity of the rain which falls upon the district. But on the other hand, even allowing that all the circumstances alluded to have been satisfactorily ascertained, still it has also been observed, that since the clearing of the mountains the different torrents and rivers which seem to have lost a portion of their waters occasionally manifest such sudden and extraordinary rises, that extensive devastations are the frequent consequence. It has likewise been observed, that after great falls of rain the springs which had almost entirely disappeared, suddenly rise with unusual impetuosity, only to subside with corresponding rapidity. The natural inference from these latter observations, as will be at once perceived, is that we are not too readily to adopt the common opinion and to admit that the cutting down of the woods diminishes the annual fall of rain, for it may not be at all impossible not only that the actual quantity of rain has not varied, but that the quantity of water passing off in the running streams may be really the same, in spite of the apparent drought at certain periods of the year both in the rivers and the springs; and possibly the only difference will turn out to be that the flowing of the same mass of water has, owing to the clearing, become much more irregular. In illustration, we may remark that if the small quantity of water which is found in the Rhone during a certain part of the year, was precisely compensated by a sufficient number of great floods, the necessary consequence would be that it still conveys to the Mediterranean the same volume of water which it did at the epoch anterior to the extensive clearings which have been effected near its principal sources, and when, probably, its mean depth was not, as it now is, subject to great variations. If these were actually the case the existence of the forests would be attended with this advantage that they would in some degree

regulate and equalize the flow of the water. But if on the other hand the whole annual quantity of the flowing water becomes less as the clearing away of the forests extends then the effect must be attributed either to the rains becoming less abundant or to its evaporation being promoted by the ground not being covered with trees and being thus deprived of shelter against the sun's rays and the wind. These two causes, which always produce a similar effect, must generally be combined. Before, however, endeavouring to estimate their influence, separately, it will be proper satisfactorily to ascertain if it be irrefragably established that the water courses of a country, where clearing has been extensively accomplished, are truly diminished, and thus assure ourselves that the mere appearance of the phenomenon be not taken for its reality. And, after all, this is the important point of the inquiry ; for let it be once established, that the clearing of a country reduces the quantity of water in its running streams, the cause of this diminution is of secondary importance. We must now, therefore, inquire if we can find in nature a set of phenomena which will act as a criterion in resolving this question.

I regard lakes, whether met with in plains or in different stages of mountain chains, as highly qualified to throw light upon this discussion. These may be considered as natural gauges calculated to assist in valuing upon a great scale, the variations which may take place in the quantities of water which fertilize a country. If the volume of these waters undergo any variation, more or less, it is manifest that this variation, whether of excess or diminution, will be indicated by the mean level of a lake inasmuch as its mean level varies at different times of the year, according as the season is wet or dry. Thus the mean level of a lake will fall, if the annual quantity of running water in the streams of the district diminishes ; on the contrary, it will rise, if these streams become more copious ; and, finally, the level will remain stationary if the volume of water which runs into the lake experiences no change. In the following discussion, I have preferred the use of those observations only which relate to lakes which have no outlet; and the reason will be apparent as we wish to ascertain changes, which may not be very considerable. However I do not disregard such lakes as have an issue for their waters, for I am certain that the

study of such will also lead to very precise results. Before proceeding farther, I shall say a few words on the meaning I attach to the phrase, change of level.

It will not be disputed that one of the most interesting districts of the kingdom of Venezuela is the valley of Aragua situated at no great distance from the coast, possessing a warm climate, and a fertility of soil which can scarcely be surpassed. In it we observe every species of cultivation which distinguishes the tropics and upon the lesser hills which rise from the valley we observe with astonishment crops which remind us of European farming ; corn grows admirably upon the heights which surround Vittoria. The valley is bounded on the north by the high land which forms the coast, on the south by the chain of mountains which separate it from Llanos, and both on the east and west a range of hills completely encloses it. By this very singular confirmation the rivers which take their rise within its enclosure have no issue, either towards the ocean or otherwise. Their waters therefore accumulate in the lowest part of the valley and form by their union the beautiful lake of Tacarigua, otherwise denominated Valencia. This sheet of water according to the testimony of M. de Humboldt exceeds in dimensions that of Neufchatel in Switzerland ; it is elevated more than 1,300 feet above the level of the sea : its length is about thirty miles and its greatest breadth does not exceed seven or eight. At the time when M. de Humboldt visited this valley the inhabitants had long remarked the gradual drying up of the waters of the lake, which had excited their attention for thirty years. But, in truth, it is only necessary to compare the descriptions supplied by the older historians with its present state, to recognise after allowing the largest deductions for exaggerations, that the waters have very considerably fallen. The facts themselves speak most distinctly.

Oviedo,* who towards the end of the fifteenth century, so often traversed the valley of Aragua, positively affirms that New Valencia was founded in 1555, at the distance of half a league from the lake of Tacarigua ; and M. de Humboldt found, in the year 1800, that town was more than three miles (2700 toises) distant from its banks. The aspect of the district exhibits addi-

* His Historia de la provincea de Venezuela was published in 1723.

tional evidence of a great change. The rising grounds which are somewhat elevated above the plain maintain to the present day the name of islands, which at a former period, was most accurately assigned to them, seeing they were surrounded with water. The space which has been exposed by the retreat of the waters has been transferred into most fertile fields for the cultivation of cotton, sugar cane and the banana tree. Those buildings which were reared in the immediate vicinity of the water are seen to be more and more forsaken by it. New islands made their appearance in the year 1796. An important military post in the shape of a fortress which was built in 1740, in the island of Cabrera, is now situated on a peninsula. Lastly, in two islands of granite, those namely of Cura and of Cabo-Blanco, M. de Humboldt discovered among the bramble-bushes, several yards above the level of the water, deposits of fine sand containing many helecites. Facts which are so speaking as these, and withal so well ascertained, could scarcely fail of exciting the ingenuity of the learned on the spot, in the way of supplying explanations of the remarkable change, and they all agreed thus far, that some subterranean conduit had been opened up which allowed the waters to flow freely to the ocean. M. de Humboldt when on the spot paid all due regard to this supposition and after an accurate examination, of the localities, came very decidedly to the conclusion, that the cause of the diminution of the waters of the lake of Tacarigua was nothing more than the extensive clearing away of the woods over the whole valley, during the course of the former half century. 'In laying low the trees,' he observes, 'which covered the tops and flanks of the mountains mankind in all climates, are at one and the same time entailing two great calamities upon succeeding generations, they are producing a scarcity both of wood and water.'

Since the time of Oviedo, who like all the older chronologists, is perfectly silent concerning any subsidence of the water of the lake, the cultivation of indigo, sugar, cotton, and cocoa, had been carried to a great extent. In the year 1800 the valley of Aragua maintained a population as dense as that of any of the most populous portions of France. The smiling prosperity which existed in the numerous villages which teemed with its industrious popula-

tion, could not be witnessed without the greatest satisfaction. Such was the prosperous condition of this charming country when M. de Humboldt was sojourning in La Hacienda de Cura.

After a lapse of twenty-two years it was my lot afresh to visit the valley of Aragua. I fixed my residence in the small town of Maracay. I soon found that, for many years, the inhabitants had been remarking not only that the waters of the lake had ceased to subside, but on the other hand, they affirmed they were very decidedly rising. The lands which had been formerly occupied in the cultivation of cotton were now submerged. The islands of Las Nuevas Aparecidas, which had risen above water in the year 1796 had now become shallows which were dangerous for navigation. The tongue of land near to Cabrera, at the northern side of the valley, was now so narrow, that the smallest rise in the lake altogether inundated it: and a steady breeze from the north-west was sufficient to submerge the road which led from Maracay to Nueva Valencia.

The fears, which for so long a time had annoyed the inhabitants on its banks, were now altogether changed in their character: and they no longer dreaded the entire disappearance of the lake. They were now anxiously considering if these successive invasions of the rising waters were about to overwhelm their properties, and those who had explained the previous diminution by the existence of subterranean canals were convinced they were now choked up and that nothing would save them but re-opening these conduits afresh.

During the two and twenty years which had intervened, important political transactions had occurred. Venezuela now no longer belonged to Spain. The smiling valley of Aragua had been the arena of the most bloody contests, and war and death had desolated those happy scenes, and greatly reduced the population. On the first cry of independence, a number of slaves obtained their liberty by fighting under the standard of the new republic. Its wide spreading cultivation was neglected: the forest trees, so luxuriant within the tropics, had again in a great measure usurped dominion over that region which its inhabitants after a century of constant and painful labour, had reclaimed. During the growing prosperity of the valley of Aragua, the numerous streams which fed the lake had been arrested and employed in innumerable irrigations, and their beds

were found dry for more than six months of the year. At the last epoch to which I have alluded, the streams being no longer so diverted, flowed without interruption. Thus, then, during the progress and continuance of agricultural industry in the valley of Aragua, when the process of clearing was pushed farther and farther, and when cultivation in every shape was advancing, the level of the water gradually subsided. More lately, on the contrary, during a period of misfortune, and, we would fain hope, but temporary, when the clearing was no longer continued and the cultivated lands have fallen back into their wild state, the waters having ceased to fall, are now very speedily assuming a decided rising movement.

I shall now direct my remarks to another quarter, without however leaving America, in which we find a climate analogous to that of Europe, and where we traverse immense districts producing the most valuable grains. I shall direct attention to the higher lands of New Grenada, and to those elevated valleys from 6,000 to 9,000 feet above the level of the sea which enjoy, throughout the year, a temperature of from 58° to 62° Fahr. Lakes are frequent among the Cordilleras; I might easily dwell upon many of these, but shall bring under review only those which have been the subject of previous observations.

The village of Ubata is placed in the vicinity of two lakes. It is an important fact that sixty years ago, those two sheets of water formed one only. The older inhabitants have observed the waters gradually diminish, and their shores extend themselves year after year. Fields of corn of the greatest fertility at the present time cover districts which thirty years ago were completely covered with water. The falling of the mean level of this lake will the more readily be credited by the consideration that an occasional fall of three or four inches lays bear a great extent of surface. If we inquire in the neighbourhood of Ubata of any of the old men, who in their younger days were devoted to the chase, or if we examine the records of any of the different parishes, no doubt will remain that numerous forests have been felled. The clearing still goes on: and it is equally certain that the retreat of the water has not ceased, though it does not advance so rapidly as it was wont to do.

The lake of Fuquena in the same valley and to the east of Ubata deserves marked attention. By barometrical measurements, made

with the greatest care, I have found that its waters have precisely the same elevation as those of Ubata. It is now nearly two centuries since this lake was visited by Don Lucas Fernandes de Piedrahita, Bishop of Panama, to whom we are indebted for the History of the conquest of New Grenada. This author, whose accuracy I have frequently had occasion to admire and more especially as it respects distances, gives the length of the lake Fuquena at ten leagues, and its breadth at three. By a very happy coincidence Dr. Roulin a few years ago had occasion to construct a plan of this same lake, and he found the dimensions to be a league and a half in length and half a league in breadth.

It may be conceived by some, that the dimensions adopted by Piedrahita are exaggerated. But this is not my opinion, and supporting myself on the one side by my barometrical observations, and on the other by the silence which all the ancient historians have maintained respecting the lake of Ubata, a silence which is the more remarkable since they have described far less considerable bodies of water, I am inclined to believe that at the time that the Bishop of Panama visited this country there existed only a single lake, which extended without interruption from Ubata to Fuquena. In this view the calculation of Piedrahita is in no degree exaggerated. At any rate, the fact of the retreat of the waters is much more important than the estimate of the extent of surface which is left bare, a fact which is not questioned by any one. All the inhabitants of Fuquena know well that the village was built quite close to the lake, and now it is about three miles distant from it. In former times it was an easy matter to procure timber for building in the environs of Fuquena. The mountains, which rise on all sides of the valley, used to be quite covered to a certain height with the trees peculiar to these elevated regions. There was the Cordillera oak (encinos) in abundance; and also a great many laurels (myrica,) from which great quantities of wax were procured. Now the mountains are nearly entirely bare, which great change is chiefly owing to the working the salt springs of Taosa and Enemocon. To all these authentic facts, whose number might be increased, it may be replied that the disappearance of the water, however incontestible, might possibly have occurred had there been no clearing of the ground, and it might be contended that their failure is owing to a wholly different

though it may be an unknown cause, and so must be ranked amongst the many phenomena whose existence is ascertained, though any thing like satisfactory explications is beyond our power.

It is true I cannot adduce here, as I did in the former case of Lake Valencia, a returning increase of the water on the suspension of the cultivation, and the renewed appearance of the woods. I may, however, procure some support for the opinion I am propounding from the extreme slowness of the present desiccation of the valley of Fuquena, since there have been no more forests to cut down. The cultivators of the soil perceiving that there is no longer the same retiring of the waters as formerly and a corresponding appearance of land, have been thinking of some more direct method than the clearing by which they might attain the same end. It was with this object that some speculative individuals thought of a plan by which they might drain off the whole water by cutting a deep water course. But, instead of dwelling on such speculative points as these I shall here adduce a direct proof; and I believe it may be found in continued attention to the same class of phenomena we have been dwelling on; I proceed, therefore, to demonstrate, that those lakes which are so circumstanced that no clearing has ever taken place in their environs, are not subjected to any alteration of their level.

I begin with lake Tota, because it is not far distant from Fuquena; also because these two are in very similar circumstances in a geological point of view; and, finally, because it is the most curious lake that is to be met with throughout the whole of New Grenada.

The lake Tota is situated at a great height in the Cordillera of Sogamoso; its elevation is above 12,000 feet. At this height vegetation almost entirely disappears. In the year 1652 the road skirted, as it still does, the margin of the lake, and the Seiches, which occurred then as frequently as they do now, often made the journey sufficiently dangerous as it is confined between the lake and a wall of elevated rocks. The waters lave the said rocks, and their level has undergone no more change than the sterile and desert country which surrounds them.

It may here perhaps be objected that I ought not to have introduced as an element in this discussion, the description of a lake which is situated on the extreme limit of vegetable existence. In

the apprehension, then, that the instance I have selected, inasmuch as I regard it a striking one may be set aside for the reason it exists in a locality composed of rocks and almost denuded of vegetation, I shall supply the description of some others which are less elevated than is Tota, and whose waters have remained stationary for ages, although they are placed in the centre of a rich country, whilst at the same time its agricultural aspect has undergone no change. I have examined some such near the equator, in the province of Quito.

On leaving Ibarra to go to Quito, we traverse a delightful valley, in which we meet with the lake San-Pablo, to which the Indians continue its ancient name Chilcapan. I found it was elevated about 8,500 feet above the level of the ocean. The temperature corresponding to this height no longer admits the cultivation of wheat or of maize, but instead, we perceive numerous fields of barley, oats and potatoes. The lower parts of the country consist of the richest pasturage, and the hills are covered with sheep, which are reared for the sake of their wool which supplies the extensive cloth manufactures of the district. The numerous villages which border on the lake existed even previous to the conquest, the great mass of the population is still purely Indian, they still preserve their old customs and their idioms, and in short matters appear in much the state they were under the empire of the Incas. The only essential difference, perhaps, which it would be possible to point out is that the rearing of sheep has been substituted for that of the lama, although these latter animals are still by no means uncommon. On the public roads we frequently encounter droves of these lamas, under the directions of the Indians who attend them, and who by their means transport their merchandise from place to place. It is a fact admitted by every one that the steppe of San-Pablo from time immemorial has never been wooded. Even under the Incas it was pasture-land. Folds for sheep which were reared on the lake more than a century ago, are witnesses that its waters have in no degree receded. The route, too, which Huayna-capac followed when he left Quito to undertake the conquest of Otavalu, marks to the present day the limits of the water.

The Cordillera which separates the valley of San-Pablo from the coasts of the southern ocean is covered upon the eastern slope, with

thick forests which are almost impenetrable. I note this circumstance, because I have the strongest conviction that an extensive clearing of wood were it to take place even on a lower level than an alpine lake, and at a considerable distance from it, would still exert an influence over the mean level of its waters.

We may here also notice, without removing from the locality we have thus introduced to notice, the singular lake of Cuicocha, which occupies a trachytic basin in which two islands, which have been examined with much care by Colonel Hall, attest the stability and the uniformity of its level. The study likewise, of the lake Yaguarcocha, or the lake of blood, so designated since Huayna-capac dyed its waters with the blood of 30,000 Canra Indians, whom he there slaughtered, would lead to a similar result. Neither of these lakes have any outlet. Instead, however, of dwelling upon them, I shall in preference select Chilcapan lake, and especially because it has a natural issue towards the north, whence rises the river Blanco. I wish to show by this selection that, as I remarked at the commencement of this discussion, those observations which are made upon bodies of water with such outlets are not to be neglected. The effect we might expect to be produced by a stream issuing from a lake is, that the stream would deepen its furrow and consequently lower the waters. I have, however, observed that in spite of this circumstance the level of lake Chilcapan has not been sensibly lowered. In attentively examining the trachytic rock in the spot from which the river Blanco takes its rise I have not been able to recognise any indication of the water producing an eroding effect.

I shall conclude what I have to observe concerning the lakes of South America by a few remarks upon the one called Quilatoa, because it has been accurately examined at two epochs, which are sufficiently distant from each other, the one being the year 1740 on the other 1831.

In travelling to Latacunga, a town situated at no great distance from Cotopaxi, a great deal is often heard of the wonders of the lake of Quilatoa. From time to time this lake throws out flames, which envelop the shrubs on its edge; and it likewise produces frequent detonations which are heard at a great distance. These statements were more than sufficient to induce M. de la Condamine, who was at Latacunga in September, 1738, to undertake an excursion to

it. He found it was almost circular, with a diameter of about 400 yards. The water was about 120 feet below the level of its abrupt margin.

It happened that I, too, found myself in the neighbourhood of this same lake in the month of November, 1831. It cannot be compared to any thing so accurately as to a crater, the bottom of which is filled with water. I found that it was elevated 11,800 feet above the level of the sea, and hence was in the cold region. It is surrounded with immense pasture grounds, and, 1,500 feet below it, there are the sheep-folds of Piliputzin. To the east the Cordillera which descends towards the coast is covered with forests which are almost unknown. The information which the shepherds who live in its vicinity gave us had little in it of the marvellous so often associated with it. They had never witnessed any flames issue from its waters ; nor had they ever heard any detonations. The result of my excursion to this lake was the observation, that all things, so far as level was concerned, were in the state they had been at the epoch of M. de la Condamine's visit.

The study of the lakes which are so numerous in Asia will probably lead to a result, in every respect conformable to that which has been deduced from the observation made in South America, viz., that the streams which water a country diminish in proportion as the clearing of it advances and its cultivation extends. The recent labours of M. de Humboldt who has supplied so much valuable information on this portion of the globe, seem to leave little doubt on this point. After having shown that the system of the Altai range extends by a succession of hills into the steppe of Kirghiz, and that, consequently, the Oural chain is not connected with that of the Altai, as has been generally supposed, this celebrated geographer demonstrates, that precisely at the place where we have been in the habit of placing the Alghinic mountains, a remarkable region of lakes commences which are continued into the plains which are traversed by the rivers Ichin, Omsk, and Ob. (See his Fragmens Asiatiques, t. i.) It might not be too much to say that these numerous lakes are the residue of the evaporation of a vast mass of water, which, in ancient times covered the whole country and which has been broken up into so many separate lakes by the configuration of the surface. In crossing the steppe of Baraba, that he might reach Barnaoul from Tobolsk

M. de Humboldt ascertained that the process of desiccation was every where greatly augmented by the effects of cultivation.

Europe also possesses its lakes, and these we have still to examine in relation to the subject before us. My own progress through Switzerland was much too rapid to allow me sufficiently to attend to the light these waters throw on this interesting point. My regret, however, is the less severe as fortunately a most illustrious observer has left some valuable documents which supply new proofs of the influence of cultivation upon the diminution of the quantity of water in the district.

Saussure, in his first researches concerning the temperature of the Swiss lakes, examined those which are placed at the foot of the lowest line of the Jura range. The lake of Neufchatel is eight leagues long whilst its greatest breadth does not exceed two leagues. In visiting this lake Saussure was impressed with the conviction that its limits at an early period must have been much more extensive; for, says he, the great level meadows and the swamps which terminate at the south-west extremity, have undoubtedly been covered with its waters. The lake of Bienne is three leagues long and one broad. It is separated from that of Neufchatel by a succession of plains which to all appearance were formerly under water. The lake Morat is also separated from Neufchatel by a level morass which no one doubts was formerly submerged. Formerly then, says Saussure, the three great lakes of Neufchatel, Bienne, and Morat were united in one great basin. In Switzerland, then, as in America and Asia, the ancient lakes which we may distinguish as the primitive ones, those which occupied the lower portions of the valleys, when the country was wild and uncultivated, have subsequently been separated into a certain number of independent ones by the drying processes to which it has been subjected.

I shall terminate my task by availing myself in this discussion, of the observations of Saussure upon the lake of Geneva. This interesting object was, as it were, the spot from whence the celebrated philosopher commenced his immense labours. No one ever studied it more deeply than he did.

Saussure admits that, at an epoch much anterior to the times of history the mountains which surround the lake were buried under water; some vast catastrophe occasioned a great disruption and

speedily the current of waters occupied no greater space than the bottom of the valley ; in short, the lake of Geneva was then formed. But turning from this to the monuments which have been constructed by man it is impossible to doubt that during the course of twelve or thirteen centuries, the waters of the Lake of Geneva have considerably retired. This is evident from the flat shores it has left near its margin, and, even in the town itself, the Quartier de Rive and the low streets have been built upon such sites. This lowering of the surface, continues Saussure, is not the result only of the wearing down of the channel whence its waters issue, it has likewise been produced by diminution of the quantity of the waters which flow into it. The general result which may be safely drawn from the observations of Saussure is that during the period of twelve or thirteen centuries, the running streams have gradually diminished throughout the districts in the neighbourhood of the lake of Geneva. And there is no one, I believe, will dispute that during that long period, there has been a vast clearing away of wood and a rapidly increasing advance in the cultivation of this beautiful country. Upon the whole, by the examination of the levels of lakes, we have arrived at this conclusion, that in those countries which have been extensively cleared, it appears very probable that there has been a diminution of the running streams which flow through the district, whilst, on the other hand, where no great change has been effected in this way, the streams have been subjected to no variation.

Great forests, therefore, in the point of view we are now regarding them appear to have the effect, first, of preserving the volume of water destined for the use of machines and of canals, and then to be an obstacle to the rain water collecting and running off with too much rapidity, being at the same time an obstacle to evaporation. That a surface covered with trees will not be so favourable to evaporation as a well wooded one is what every one will admit, without discussion. But that the difference of these two conditions may be adequately appreciated, it is necessary that the traveller should successively pass through a country which has been cleared and one which has not some time after the rainy season is over. It will then be seen that the portion of his journey in the forest is still covered with mud while those in the open country are completely dried. It is especially in South America that the obstacles to evaporation in a

region shaded with thick forests are conspicuous. In these situations the humidity is perpetual, even long after the rainy season is past. The paths which are formed through them are during the whole year nothing better than sloughs, and the only method of drying these forest roads is to make them as broad as 200 or 300 feet, which in fact is a method of clearing them.

When it is once admitted that the running streams are diminished as the result of clearing, it may then be important to examine whether this diminution arises from the quantity of rain being lessened, or from the greater evaporation, or finally if it be owing to irrigation.

I have already admitted at the commencement of this paper that it was nearly impossible to assign any exact proportions to these different co-operating causes. I shall, nevertheless, in conclusion, endeavour to appreciate their respective influence in a general way. And the discussion will subserve one important object if I prove that there may be a diminution of the running streams from the clearing alone without the simultaneous action of the other causes.

First, with regard to irrigation we may remark that it is necessary to distinguish between the case where extensive cultivation takes the place of a forest and that in which a sterile district which was never wooded becomes cultivated under the efforts of human industry. In the former case it is probable that the irrigation will contribute little or nothing in effecting any alteration in the mass of running water; for it must be generally admitted that the quantity of water consumed by the vegetation of any given surface of forest, must equal if it does not exceed, that which would be absorbed by an equal surface devoted to culture after it has been cleared. From this it follows, that the influence exerted by this cultivated district corresponds to the condition of lands which have been cleared acting solely by favouring the evaporation of the rain water. In the latter case again that is to say where a great extent of uncultivated land shall have been reclaimed, there will be an evident consumption of water by the vegetation which has been there promoted : and the introduction of agricultural industry will under these circumstances tend to diminish the water-courses which traverse the country. It is very probable that we are to attribute to this circumstance the gradual drying up of the lakes which to a certain extent gauge the

running streams of the north of Asia. It is almost useless to add, that under circumstances of this nature, the effect produced by the simple evaporation of the rain water is not augmented ; on the contrary it ought to be rather less, for on a soil covered with plants water will not so readily evaporate as on one destitute of vegetation.

Again in the considerations I have supplied concerning the lakes of Venezuela, of New Grenada, and of Switzerland, the disappearance of a part of the flowing streams, which are tributary to these lakes, might be attributed simply to a more limited fall of rain ; whilst on the other hand, with quite as much reason it might be maintained it was the consequence solely of the more rapid evaporation of the rain water. Beyond doubt there are circumstances under the influence of which the diminution of the streams is the result simply of a more active evaporation. I meant to have produced a good number of examples bearing on this point. But in a discussion of this sort it is not so much numerous as well authenticated facts, that it is important to supply. Influenced by this consideration I shall limit myself to the production of two facts ; the one derived from M. Desbassyn of Richemond, who observed it in the isle of Ascension ; and the other drawn from my own notes being one of the observations I made during a sojourn of many years at the mines of Marmato.

In the island of Ascension, a beautiful spring has been noticed situated at the foot of a mountain which was originally wooded, by degrees the spring was less copious, at length failed ; during this process the forests were cut down and the mountain was cleared. The disappearance of the spring was attributed to the clearing. The mountain was again planted, and after a few years the spring re-appeared, became gradually more productive and finally was as copious as ever.

The metalliferous mountain of Marmato is situated in the province of Popayan in the midst of immense forests. The stream of water upon which the stampers are placed is formed by the union of many small brooks which take their rise on the plateau of San Jorge. The whole environs of the establishment are thickly studded with wood. In the year 1826, when I for the first time visited these mines, Marmato consisted of some miserable huts possessed by a few Negro slaves. In 1830 the epoch at which I quitted this locality, Marmato exhibited the most exhilarating appearance. There were now seen

great workshops, a foundry for gold, and powerful machines for the division and amalgamation of this precious metal. There was now a free population of nearly 3,000 inhabitants settled on the mountain side. All this implies that the wood had been extensively cut down for the manufacture of the machines, the construction of the buildings and the preparing of charcoal. That it might be the more easily carried on all this was done upon the plateau of San Jorge itself. The clearing had been going on for scarcely two years, when it was noticed that the quantity of water which was required for the machines had conspicuously diminished. The volume of water is in fact measured by the work which the machines perform; and trials by gaging, at different times, have likewise proved the diminution of the water. But this is at Marmato an all important subject, for a diminution of the fluid moving power is always followed by a diminution in the production of gold.

In these two cases of Marmato and Ascension it is not at all probable that an extent of clearing so local and limited could have such an effect upon the meteorological condition of the atmosphere, as in any degree to vary the annual amount of the rain which falls throughout the country. But the question need not be left in this uncertainty. At Marmato as soon as the diminution of the supply of water was ascertained a rain-guage was established, and it was found, by the observation of the second year that a greater quantity of rain had fallen than during the first, although the clearing had been continued and there was no appreciable increase of the quantity of water at the wheels. Two years of hydrometrical observations are sufficient even in the tropics to exhibit the variation in the annual quantity of rain, and the observations at Marmato establish that the mass of running water has diminished at the very time that the quantity of rain had increased.

It is then probable that local clearings of no great extent may diminish the copiousness of springs and rivers, and even cause them to disappear, and under circumstances where these effects can in no degree be attributed to a diminution of the fall of rain.

Finally, we have still to examine if the extensive clearing of forests, extending over considerable districts has any effect in making the rain less copious? In reply we remark that it is only hydrometrical observations that can lead to the solution of this question. And unfor-

tunately the observations of this sort which might be at our command, do not reach back far enough and, so far as Europe is concerned, they were not commenced till the whole clearing process was well nigh over. The United States of America, however, where the forests are disappearing with astonishing rapidity, may perhaps supply the required data at no distant period.

In studying the phenomena of rain under the tropics I have at length formed, in connection with this question of clearing, a very decided opinion, which I have freely communicated to many. I regard it certain, then, that a very extensive clearing diminishes the annual quantity of rain which falls upon a country.

It has long ago been remarked, that, in equinoctial regions the epoch of the rainy season returns every year with astonishing regularity. This is most true, whilst at the same time this meteorological fact ought not to be announced in terms too general. There is the greatest possible regularity in the alternation of wet and dry seasons in those countries whose territory is very much varied. Thus a country which at once exhibits forests and rivers, mountains and great plains, lakes and extensive table lands, will at the same time exhibit periodic or changing seasons with a regularity which is quite remarkable. This, however, is no longer true if the territory be more uniform, and if it become in any way peculiar. The epoch of the return of the rainy season will be much less regular if the face of the country be exposed and arid; also if cultivation to a great extent has partially taken the place of forests; and finally if the rivers are numerous, the cultivation be but limited, then the irregularity of the seasons will still manifest itself, but with quite a different character. Rain will then predominate, and in some years it will become, so to speak, continual.

The continent of America presents to us, in immense extent, two regions which are placed under the same conditions as to temperature, and in which we successively meet those circumstances which are the most favourable to the formation of rain and those which are of directly opposite character. In leaving Panama, and travelling towards the south we pass the Bay of Cupica the provinces of San Buena Vantura, of Choco, and of Esmeraldas. In this country, covered with thick forests, and furrowed by a multitude of rivers the rains are almost unceasing. In the interior of Choco, no day passes without rain. On

the other side of Tumbez towards Payta, an entirely different set of objects present themselves. The forests disappear, the soil is sandy, and of vegetation there is scarcely a vestige. Here rain, so to speak, is unknown; when I was at Payta, according to the testimony of the inhabitants, it had not rained for seventeen years. This want of rain is common in all the countries which border on the desert of Sechura, and extends as far as Lima. In these countries rain is as seldom seen as are trees.

Thus, in Choco, whose soil is covered with forests, it rains continually; on the coast of Peru, the soil of which is sandy, devoid of trees, and destitute of verdure, it never rains; and this, as I have already said, under a climate precisely the same as to temperature, whose exposure and distance from the mountains is very nearly the same. Peru is not at a greater distance from the Andes of Assuay than are the humid plains of Choco from the western Cordillera.*

In the case of Marmato the evidence furnished by the rain guage proved beyond a doubt that the diminution of the running water was not owing to a diminished fall of rain, as it was found by the observations of the second year that a greater quantity of rain had fallen than during the first; nor do I imagine the diminution was solely owing to the lands being deprived of the protection from the sun's rays which the leaves and branches afford, but the lands being cleared the fallen leaves and roots of the trees no longer existed to retard the flow of the water which fell: while 3,000 inhabitants of an active flourishing settlement engaged in the cultivation of the articles indispensable to the existence and comfort of man would soon cause on the table land of San Jorge the great change in the quantity of spring water which is the result of high cultivation, or agricultural improvement of a country. While the face of a country is rough the rain water remains long among its inequalities, slowly sinking into the earth to feed the springs or slowly running away from the surface, as from bogs and marshes, towards the rivers. The rivers hence have a comparatively gradual and regular supply even when rain has not fallen for a long time, but in a well drained and well cultivated country the rain by a thousand channels finds its way to the brooks and rivers, almost immediately, producing often dangerous floods or inundations of the neighbouring low grounds.

* Jameson's Edinburgh Phil. Journal, p. 85, vol. xxiv. 1838.

In addition to the moisture which trees bring to the earth in the form of rain they furnish a valuable supply by condensing the fogs which occur. In heavy fogs, in elevated situations especially, trees are perfect alembics, and no one, who has not attended to such matters, can imagine how much water one tree will distil in a night's time by condensing the vapour which trickles down the twigs and boughs so as to make the ground below quite in a float.

Trees in leaf have such a vast proportion more of surface than those that are naked, that in theory their condensations should greatly exceed those that are stripped of their leaves; but as the former imbibe also a great quantity of moisture it is difficult to say which drip most; but this I know, that deciduous trees that are entwined with much ivy seem to distil the greatest quantity. Ivy leaves are smooth, and thick, and cold, and therefore condense very fast; and besides evergreens imbibe very little. These facts may furnish the intelligent with hints concerning what sorts of trees they should plant round small ponds that they would wish to be perennial; and show them how advantageous some trees are in preference to others.

Trees perspire profusely, condense largely, and check evaporation so much that the woods are always moist, no wonder, therefore, that they contribute much to pools and streams. In Newton Lane in October on a misty day, an oak in leaf dropped so fast that the cart-way stood in puddles and the ruts ran with water though the ground in general was dusty. That trees are great promoters of lakes and rivers, appears from a well known fact in North America; for since the woods and forests have been grubbed and cleared, all bodies of water are much diminished: so that some streams, that were very considerable a century ago, will not now drive a common mill. Besides, most woodlands, forests, and chases, with us abound with pools and morasses, no doubt for the reason given above.

Trees require a great quantity of water to supply their organs. This is given off in perspiration by their leaves. In the experiments of Hales, of the quantity of water taken up by plants, it was found that a pear tree which weighed seventy-one pounds, absorbed fifteen pounds of water in six hours and that branches of an inch diameter, and from five to six feet high, sucked up from fifteen to thirty ounces in twelve hours. When these were stript of their leaves, they only sucked up one ounce in twelve hours.

The house in which we resided in Fife was built on a greenstone rock on the south brow of the high ground overlooking the beautiful river Leven, about two hundred feet above its level, and five hundred feet distant from it. We there remarked that, even in closets in the garrets, shoes and all kinds of leather, soon become mouldy, which could be produced only by the moisture generated by the trees, which in thick groves closely surrounded the house.*

Trees in full foliage have long been noted as great attractors of humidity and a young wych elm in full leaf affords a good example of this supposed power; but in the winter of the year when trees are perfectly denuded this faculty of creating moisture about them is equally obvious though not so profusely. A strongly marked instance of this was witnessed by me, when ascending a hill in the month of March. The weather had previously been very fine and dry, and the road in a dusty state; but a fog coming on an ash tree hanging over the road was dripping with water so copiously, that the road beneath was in a puddle, when the other parts continued dry and manifested no appearance of humidity. That leaves imbibe moisture by one set of vessels and discharge them by another is well known, but these imbibings are never discharged in falling drops: the real mystery was the fog in its progress was impeded by the boughs of the trees, and gradually collected on the exposed side of them, until it became drops of water, whereas the surrounding country had only a mist flying over it. Thus in fact the tree was no attractor, but a condenser; the gate of a field will in the same manner run down with water on the one side, and be dry on the other, as will a stick or a post, from the same cause. It is upon this principle that currents of air will be found under trees in summer, when little is perceived in open places and the under leaves and sprays will be curled and scorched at times, when the parts above are uninjured. The air in its passage being stopped and condensed against the foliage of the tree, it accordingly descends along its surface or front and escapes at the bottom where there are no branches or leaves to interrupt its progress. In winter there is little to impede the breeze in its course, and it passes through; consequently at this season the air under a tree is scarcely more sensibly felt than in the adjoining field.†

* White's Natural History of Selborne, p. 195.

† Journal of a Naturalist, p. 61.

Similar phenomena are constantly observed when the air is full of moisture, after the rainy seasons of India. One of the most marked instances which have fallen under my own observation, however, was one morning in 1838 to the westward of Secunderabad. The first hour's ride lay over a bare plain, the sand on which betrayed no appearance of moisture, but on entering a plantation enveloped in a fog my clothes were soon saturated by the fog, which existed there, being condensed by the leaves overhead. In the islands lying in the tract of the south-east trade winds, their mountain summits covered with wood are formed by the leaves and branches into an unceasing condensing apparatus, while the closeness of the trees and the dense foliage prevent the ground they shade ever drying. This was finely shown to me in December, 1834, when in the Isle of France. At sunrise along with some companions, I left the plains on which were growing the orange, the pine-apple, and the palm trees of the tropics, and advancing up the mountain we first passed over ground cleared of wood where the sheep of the farmers were grazing, and then entering upon a small tract which led directly up the mountain we soon became involved in the gloom caused by the shade of the gigantic black wood trees which grow there. We passed by several immense masses of rock which having been detached by some accident from a higher situation, had come sweeping down the mountain's side, leaving in their tracts uprooted and overthrown trees.

Shortly after we entered this forest it rained for a short time but soon cleared up ; but when we had almost reached the summit a fog so dense came on that our party wandered from the road, this fog was so fast condensed by the leaves of the trees that the drops fell from them much more rapidly than the rain had fallen, and before the slaves, who were our guides, could extricate us from the forest, we were completely drenched. I had gone up with the intention of collecting specimens and had only obtained one (the hedgehog of tropical climates and supposed peculiar to Madagascar) when this condensation of vapour commenced, and while being thus drenched from the fog on the summit of the hill the sun was shining on the plains and the reports from the fowling pieces of the sportsmen there were heard every minute.

This remarkable condensation of the moisture in the air of the mountains of the Mauritius may possibly have been observed by all who have ascended them, as Mr. H. Hayter describes having wit-

nessed a similar phenomenon when lately climbing to the tops of the Peter Botte mountain there. At dawn of day, he says, we snatched a hasty breakfast and were fairly on the move by six o'clock. Our route lay up a steep ravine at the lower part of which grows a dense forest of ebony and "bois de natte" through which we made our way and soon got completely wet through from the dripping of the dew from the branches of the trees and long grass.*

There is one more means by which the vegetable world collects the moisture of the atmosphere, viz. by forming dew. Although the advantage a climate derives from this is not so apparent, yet the supply obtained is by no means scanty or devoid of utility, for it assists in the nourishment of the plant and enables it to supply the wants of man with its fruits and to scent the air with the fragrance of its flowers. When it is mentioned that the quantity of dew deposited during the year in Britain is reckoned at five inches, (half the quantity of the rain, which fell in 1838 at Bellary,) the agreeable freshness such a quantity of moisture will cause when again becoming vapour will readily be comprehended. The quantity of moisture taken up by the atmosphere during the day very much influences the quantity of dew which falls at night. Dew is first deposited on the bodies, which radiate heat most powerfully as grass, twigs, and leaves of trees; some trees however, are even famous for the quantity of water they collect from dews which hang about them, and there is not, perhaps, among all the numerous examples that occur of the provident economy of nature in the vegetable world, a more remarkable instance than that displayed in a plant commonly met with in Ceylon and other islands of the east, and which has obtained the appropriate name of the pitcher plant.

Being the inhabitant of tropical climates, and found on the most dry and stony situations, nature has furnished it with the means of obtaining an ample supply of moisture without which it would have withered and perished. To the footstalk of each leaf near the base is attached a kind of bag, shaped like a pitcher, of the same consistence and color as the leaf in the early stage of its growth, but changing with age to a reddish purple. It is girt round with an oblique band or hoop and covered with a lid neatly fitted and moveable on a

* Recent ascent of the Peter Botte Mountain, by Mr. Hayter, Illustrated London News, p. 142, 2d September, 1848.

kind of hinge or strong fibre which passing over the handle connects the vessel with the leaf. By the shrinking or contracting of this fibre the lid is drawn open whenever the weather is showery or dews fall, which would appear to be just the contrary of what usually happens in nature, though the contraction, probably, is occasioned by the hot and dry fibre: and the expansion of the fibre does not take place till the moisture has fallen and saturated the pitcher. When this is the case, the cover falls down and it closes so firmly as to prevent any evaporation taking place. The water being gradually absorbed through the handle into the footstalk of the leaf, gives vigor to the leaf itself and sustenance to the plant. As soon as the pitchers are exhausted, the lids again open to admit whatever moisture may fall, and when the plant has produced its seed and the dry season fairly sets in it withers with all the covers of the pitchers standing open.

The manner in which Providence has contrived a supply for the thirst of man in dry situations is equally worthy of admiration. On some parched districts of Africa nature has planted a great tree called by the negroes Poa, the trunk of which of prodigious bulk is naturally hollowed out like a cistern. In the rainy season it is replenished with water, which it keeps cool during the most intense heat by means of the tufted foliage which crowns its summits. Finally, she has placed vegetable fountains on the arid rocks of the Antilles; you commonly find on them a liane called the water liane, so full of sap that if you cut a single branch as much water is immediately discharged as a man can drink at a draught: it is perfectly pure and limpid. In the lagoons of the Bay of Campeachy travellers find relief in a different manner : these lagoons, on a level with the sea, are almost entirely inundated in the rainy season, and are so parched in the dry season that hunters who have accidentally lost their way in the forests by which they are covered, have actually perished of thirst. The celebrated navigator Dampier relates that he several times escaped that calamity by means of a very extraordinary species of vegetation, which had been pointed out to him on a kind of pine very common in those parts. It resembles a parcel of leaves placed one over the other in stages and on account of its form and the tree upon which it grows he calls it the pine-apple. This apple is full of water, so that on piercing the lower part of it with a knife a good pint of very clear and wholesome water immediately

flows from it. Father du Tertre relates that he often found the same kind of refreshment in the horn shaped leaves of a species of balisier, which grows on the sandy shores of Guadaloupe. I have heard many of our sportsmen remark that nothing is more proper for quenching thirst than the leaves of the misletoe which grows on our trees.

The thick green leaves of plantain trees readily condense the moisture of the atmosphere, and there is at all times within their different layers a quantity of pure clear water which may be collected by making an aperture in their stems. A tree of a similar character exists in the Mauritius, and the first time I became aware of this I received an agreeable surprise when the gardener at Pamplemoos plunged his knife deep into its stem and allowed the stream of pure water to spring in a jet from the wound.

Such are in part the precautions employed by Providence, to compensate in favor of man the inconveniences of every climate by opposing to the qualities of the elements contrary qualities in vegetables.*

The facts detailed seem to establish,

1st. That the extensive clearing of a country diminishes the quantity of running water which flows over its surface.

2d. That it is impossible for us to determine, at present, whether this diminution is owing to a smaller annual fall of rain or to an increased evaporation of the surface water, or to these two causes combined.

3d. That it is however shown by the authors above quoted that rain oftener falls, and that more dew is deposited in well wooded countries than when the country is naked; and, drawing our conclusions from the meteorological facts collected in equinoctial regions, we may presume that the extensive clearing of a country diminishes the actual quantity of rain which falls upon it.

4th. That mountains, particularly when covered with their native forests, by an electric action on the atmosphere, cause clouds to form around them; collect and condense the vapours of the air, and equalise the fall of rain.

5th. That the forest trees which grow on mountain summits have a structure peculiarly fitting them to receive the waters of the clouds.

6th. That lands destitute of the shelter of trees allow of more rapid evaporation.

* St. Pierre's Studies of Nature, vol. ii. p. 322, ed. 1846.

7th. That independent of the preservation of surface water forests husband and regulate its flow.

8th. The above authors also show that in all forest tracts the temperature of the air is more equable throughout the year : that in tropical regions the atmosphere around trees is cooler and contains more moisture than the air on the open glade ; that the atmosphere of a tropical country without trees, has an arid dryness in it totally dissimilar to the cool softness of a well wooded one; that lands covered with trees are cooler and moister than those which are exposed : that in hot climates the destruction of forest trees, by inducing aridity, destroys vegetation; and that forests and trees afford the shelter from violent winds which is absolutely essential to the health of the vegetable creation.

9th. That springs draw their supplies from sources in their immediate vicinity, and the presence of trees near these sources, seems to prevent the dissipation of the supply of water.

10th. That in clearings which are purely local springs may disappear without there being any ground to conclude that the annual quantity of rain has diminished.

11th. That the tenacious clayey under-soil found in forests is peculiarly adapted for preserving the surface and subsoil waters.

12th. That there is a difference in the condensing power of trees, but, by means of the vegetable creation, a valuable supply of moisture is collected from fogs, and from the atmosphere in the form of dew.

If the facts detailed warrant these deductions it may be confidently asserted, that Southern India would be greatly enriched and its climate ameliorated by the introduction of arboriculture.

It is only the government or the civil servants of the state who could accomplish any thing on a great scale, but their efforts may be seconded by every individual resident in it, and the man who makes a few trees grow where none grew before will be a benefactor to this country.

It is highly improbable that this cultivation would ever be carried to an excess likely to injure the health of the neighbouring inhabitants. The danger to Europeans at least, are purely imaginary and equally so in my opinion to the native population, although their spare diet and spare forms, their food and mode of life greatly expose

them to the influence of vitiated air. But even with every excess we may with full confidence assert that the increased mortality which many most gratuitously assume as the inevitable consequence of much vegetation, would never amount to five hnndred thousand, the number of the native population that are said to have died in 1839, in India, of famine alone.* A famine sweeping whole cities nay whole districts from the earth must far exceed, in the amount of misery and number of deaths it occasions, the hardships which would be entailed on a family by one of its members being carried off from a more sickly climate, even supposing that the planting of trees would ever become excessive or cause a climate to become worse, which I do not believe.

Many famines have occurred in this country and one or two of them may have been caused by wars, and other causes unconnected with climate, but most of them have been owing to droughts, and our efforts to prevent their recurrence must be made to procure an ample supply of water; for rich as the soil is in many parts of India, the soil acts a very secondary part. In a tropical country water is all in all: for let the soil be ever so stony or sandy a good supply of water will make various grains spring from it in abundance. But to obtain our utmost supply of water from the atmosphere we must plant trees: to prevent the rain as soon as it falls from rushing to the rivers and thence to the ocean, in fact to retard its flow and thus be enabled for a longer period to employ it for agricultural purposes, we must plant trees, and we must plant trees in order to have a few springs of water trickling from the mountain sides.

Were the hills in India covered with trees neither the torrents, which rush from them during the rainy season, nor the dry cracked and burned up appearance that they present during the hot season would longer be seen. If we can imagine the mountains in the Mauritius near the Petre Botte or the Petre Botte itself instead of being covered with tall trees to be perfectly bare of wood, in the first place none of the clouds which so frequently hang on their summits would ever be condensed, and the rain if it fell would rush down the rocky sides of the mountains in torrents, their beds becoming dry the moment the rain ceased ; but with their well clad sides much water is

* *Agra Ukhbar* for January, 1840.

derived from the clouds which would otherwise fly off without contributing to the earth's demands, and both this supply and that which falls on them as rain runs slowly among the roots of the trees and under shrubbery to the plains below, or sinking into the crevices of the rock it springs out at a lower level, affording to the inhabitants a continual supply of pure water.

Considering the great numbers famines* have destroyed it cannot seem an unnecessary anxiety again to urge that trees be extensively planted to obtain a more abundant and more regular supply of rain for the country, to endeavour to prevent their recurrence. And while effecting this object we would likewise be obtaining wood for economic purposes, and when it is mentioned, that in many parts of the peninsula of India, the natives use masses of granite or hornblende rock as wheels for their carts, it is superfluous to make further comment on the scarcity of this useful article.

It is not my object here to allude to the mode of cultivation, nor to the species of trees which should be cultivated, but I may just remark that in cold climates where there is abundance of water, shelter from the inclement winds seems the great want to be provided for; while, in this country, the chief provision required, is water. But should the recommendation now made ever be acted upon, there seems no occasion for Government to incur the unnecessary expense that would be the result of planting good productive land with trees of a description difficult to rear or requiring to be attended to and watered for years; for besides the fact that it is the forest trees on mountains, which are most useful, there are some kinds of trees which will take root and grow any where, and if such be selected and their seeds sown at the proper seasons many of the unproductive lands in India might be covered with trees, and thus become subservient to man.

EDWARD BALFOUR, Assistant Surgeon,
Madras Army.

* Within the first five years from our first acquisition of the technical sovereignty of the Bengal Provinces in 1765, a famine prevailed which swept off in two years time one-third part of the entire population—probably an exaggeration, but which is not denied by any party—destroyed as many of the human race as the whole inhabitants of the present kingdom of Holland.

Extract from the Minutes of Consultation.

Para. 1. The Right Honorable the Governor in Council has perused with much pleasure and satisfaction, the valuable and very interesting Report furnished by Assistant Surgeon Balfour on the effect of trees on the climate and productiveness of a country, and deeming it of importance that the local Revenue Officers should be in possession of information so intimately connected with the welfare of the districts under their respective charges, he resolves to direct that copies of the same be printed at the *Fort St. George Gazette Press* for general distribution and for transmission to the Government of India, and the Governments of Bengal, Bombay and Agra, and the Honorable the Court of Directors.

2. In Extract Minutes of Consultation, dated 8th October, 1847, No. 1116, the Government called for information on the same subject through the Board of Revenue, and it is the intention of the Governor in Council similarly to have printed and circulated for the use of the Revenue Officers all reports which may be deemed by the Board as useful and inducing suggestions for practical purposes.

3. It will be for the Board of Revenue when they shall have received all the information forthcoming on this subject to consider the measures it will be necessary to take to prevent the too great clearance of forests where they exist, and to promote their growth where they do not, or where they have been thinned. The propriety of restricting leases for large tracts of forest land for cultivating purposes should also be had in view, and every opportunity taken in connection with the usage and rules for planting topes and trees in the several districts, of forming continuous and extensive plantations of wild trees of large growth in suitable positions. It is believed that when the local Officers interest themselves in the welfare of a district and feel how much of it is dependant on the growth of forests, neither difficulty nor the expense of raising up forest tracts will be great. It is the practice at present in some districts to make an annual disbursement for planting palmyras for Revenue purposes, an extension of the principle, and a judicious selection of the sites and description of trees seem alone necessary to ensure success in the department to which the Home and the Indian Governments have now turned their attention.

4. Various other points may occur to the Board, or suggest themselves on a perusal of the reports which may be furnished to them, and the Government expect that the Board will take the same interest as they themselves feel, and propose for practical operation whatever they may consider conducive to the well being of the country.

5. The Governor in Council resolves to furnish to Assistant Surgeon Balfour a copy of the foregoing Proceedings, and to convey to him at the same time the thanks of Government for his interesting communication.

REVENUE DEPARTMENT.

No. 488.

Extract from the Minutes of Consultation, under date the 18*th May*, 1849.

Read the following letter.

No. 9.

From Major General W. CULLEN, *Resident at Travancore and Cochin.*

To J. F. THOMAS, *Esq., Chief Secretary to Government, Fort St. George.*

SIR,—I have the honor to acknowledge receipt of a letter from the Secretary to Government No. 1118 of the 8th October, 1847, with its enclosures, copy of a letter from the Government of India, and of a despatch from the Honorable the Court of Directors, requiring information " respecting the effect of trees on the climate and productiveness of a country or district, and the result of extensive clearances of timber."

From my own knowledge of the features and general appearance of these two provinces, Travancore and Cochin, I was not of opinion that any such considerable, and at the same time permanent clearances of forest lands had taken place within the last half century, as to cause any sensible effect upon the climate or productiveness of the country.

I have observed in various places partial clearings, but these appear to have generally been followed by the abandonment of equal tracts of previously cleared land, for the clearances have not been the consequence of a steadily increasing population, and therefore permanent in their nature, but chiefly from the mere nomad propensities of a scanty hill population, aware of the superior fertility of all such newly reclaimed land. The heaviness of the rains and the

general fertility of the soil, rapidly promoting the regrowth of forests on the tracts previously cleared. At the same time I have no doubt that the process of clearing is slowly advancing under these sirkars, and that it may in due time have a certain effect on the climate and apparent productiveness.

I have been able to procure but little satisfactory information on these subjects from individuals settled in the country, but I have forwarded herewith copy of a letter from the Dewan of Cochin, as also copy of a private note from the Reverend Mr. Mault, of the London Mission Society, who has been settled for the last 30 years nearly at Nagercoil in the south of Travancore, and who has had much opportunity of observation in his visits to his different schools and chapels in the interior.

It is facts, as the Reverend Mr. Mault observes, however, and not opinions, that are really valuable, but after all, how few are the facts that are procurable ; we can obtain little else any where than the result of casual observation and experience :—the remarks even of the celebrated Humboldt appear to be supported by but few, if any, actual meteorological data.

On the effect of cutting down forests he observes, that " they affect the copiousness of springs, not as was long believed by a peculiar attraction for the vapours diffused through the air, but because by sheltering the soil from the direct action of the sun, they diminish the evaporation of the water produced by rain."

" When forests are destroyed, as they are every where in America by the European planters, with an imprudent precipitation, the springs are entirely dried up or become less abundant."—Personal Narrative, vol. 4, p. 143-4—and

Again " with the destruction of the trees, and the increase of the cultivation of sugar, indigo, and cotton, the springs and all the natural supplies of the lake of Valencia have diminished from year to year." Vol. 4, p. 144.

No meteorological observations, however, are given in support of these conclusions, at least not in the Personal Narrative.

Monsieur A. Moreau de Jonnes, a Staff Officer in the Army of Belgium, obtained about the year 1828 a prize for an essay on these subjects, from the Philosophic Society of Brussels. He maintained:

1st. That " the clearing of woods makes the temperature of countries warmer."

2d. "That more rain falls on the sea coast than in inland districts, and that, when chains of mountains run parallel to the sea shore, the sides next the sea receive more rain than their opposite sides."

3d. "That woodlands in flat countries do not perceptibly increase the quantity of rain, but that woods on mountains have a perceptible influence in producing that effect."

Monsieur Moreau de Jonnes' work is stated to have originated in representations at the commencement of the French Revolution, of the injurious effects on the climate, &c. of France by the rapid cutting down of forests.

In France in 1750 the woods are stated to have occupied $\frac{1}{4}$ of the surface of the country; in 1788, $\frac{1}{7}$, and in 1814 only about $\frac{1}{12}$. In England, according to M. Moreau de Jonnes, the woods occupy only about $\frac{1}{23}$ of the surface.

There is also an interesting paper on the subject of climate, as affected by the clearances of forests, in Silliman's American Journal of Science and Art, by Dr. Forry of the United States.

"Dense Forests," he observes, "and all growing vegetables, doubtless tend considerably to diminish the temperature of summer, by affording evaporation from the surface of their leaves, and preventing the calorific ray from reaching the ground."

"Snow lies longer in forests than on plains, because in the former locality, it is less exposed to the action of the sun."

"At Hudson's Bay the ground in open places thaws to the depth of 4 feet, and in the woods to the depth of only 2 feet."

"Moreover, it has been determined by thermometrical experiment, that the temperature of the forest at the depth of 12 inches below the surface of the earth, is, compared with the adjacent open field, at least 10° lower during the summer months, while no difference is observable during the season of winter."

Lyell in his principles of geology observes, that "in the United States of N. America it is unquestionable, that the rapid clearing of the country has rendered the winter less severe, and the summer less hot; in other words, the extreme temperature of January and July have been observed, from year to year, to approach nearer to each other: whether in this case, as in France, the mean temperature has been raised seems by no means yet decided, but there is no doubt that the climate has become, as Buffon would have said, 'less excessive.'"

Dr. Forry remarks on the above passage that "it is unsustained by any well observed facts."

Dr. Webster, another American writer on the climate of N. America, arrives from a most extensive investigation of historical facts at the conclusion, "that the winters have been from the first settlement of America variable; now mild, now severe, just as they are in the present age." A leading object with him is to show the error of Dr. Williams, who, having maintained that the mean temperature of Italy "has increased 17°, wished to establish some analogous change in our climate since its occupation by Europeans, and Doctor Webster proves most conclusively, that, if Doctor Williams is unfortunate in his facts, he is still more so in his reasonings and deductions."

Dr. Webster concludes with the following passage as 'the result of clearing the forests.—"From a careful comparison of these facts he says, it appears that the weather in modern winters is more inconstant, than when the earth was covered with wood at the first settlement of Europeans in the country; that the warm weather of autumn extends farther into the winter months, and the cold weather of winter and spring encroaches upon the summer," &c.

Dr. Forry concludes his interesting paper with the following remarks: "that climates are susceptible of melioration by the extensive changes produced on the surface of the earth, by the labors of man, has been pointed out already; but these effects are extremely subordinate, compared with the modifications induced by the striking features of physical geography, the ocean, lakes, mountains, the opposite coasts of continents, &c."

Again: "The fallacy of the opinion which ascribes the mild climate of Europe to the influence of agricultural improvement becomes at once apparent, when it is considered, that the region of Oregon lying west of the rocky mountains, which continues in a state of primitive nature, has a climate even milder than that of highly cultivated Europe in similar latitudes; and again, China situated like the United States on the eastern coast of a continent, though subjected to cultivation for several thousand years, possesses a climate as rigorous, and some assert even more so, than that of the United States on similar parallels."

It is singular, however, that in the foregoing elaborate paper, no

estimate is attempted to be formed of the actual area cleared of forests within the last hundred years.

My own attention has of late years been much given to the subject of the fall of rain, as connected with the vicinity to high ranges of mountains:—I had noticed the accounts of the great annual fall of rain on the Mahabaleshwar hills, and at Merkara in Coorgh; and several years ago, with a view to similar observations, I established a rain guage on the summit of the high range of ghat mountains 22 miles east of Trevandrum, and where I found the fall of rain to be from 4 to 6 times the quantity on the sea coast. The obstruction to the passage of the vapour from these mountain chains, and its consequent condensation, the monsoon winds being nearly at right angles to the line of ghats, seemed to me to offer so decided and satisfactory an explanation of the phenomena, that I at once adopted it. These observations on Uttree Mullay and other tables of the fall of rain, which I have for several years past been collecting, although without reference to, or in illustration of any particular theory, may be of some interest in the present inquiries, as to the effect of forests in promoting the fall of rain.

I have established rain guages all along the sea coast from Cape Comorin to the latitude of Ponany, and I have also by the assistance of friends, been enabled to get several sets or lines of registers running directly inland; and perpendicular to the line of coast, for a distance of about 60 miles; thus exhibiting, not only the effect of distance from the sea, but also that of contiguity to the great chain of ghats separating Malabar from the provinces of the Carnatic.

The first of these inland lines is from Quilon to Shenkotah and Palamcottah, with rain guages at

	Distance.	Altitude above Sea.	Rain.
INLAND LINES.	Miles.	Feet.	Inches.
Quilon,	Sea Coast	25	65
Kept by W. Huxham, Esq. { Puttnapoorum	25	150	99
Kept by W. Huxham, Esq. { Shalakurray,	30	160	106
Kept by W. Huxham, Esq. { Koraventavalum,	36	350	113
Kept by W. Huxham, Esq. { Caldoorty,	41	750	128
LINE OF GHATS.			
Shenkotah	52	600	44
Palamcottah	70	150	24

It will be observed from the map, that Puttnapoorum the 1st station from Quilon, at 25 miles from the sea, is just where the high road enters the mass of high mountain ridges and spurs running out from the great chain of ghats.

From hence to the pass through the ghats, an interval of about 20 miles, is a dense mass of chains and groups of high mountain ridges from two to four and five thousand feet in altitude, running parallel to each other in a north-westerly direction, and covered with primeval forests. The gradual increase in the fall of rain up to Caldoorty at the very base of the ghats is very remarkable, as well as its sudden decrease on the east of the ghats at Shencottah, an interval of only 12 miles, causing a diminution from 128 to 46 inches.

There are no forests of consequence at Puttnapooram, nor for several miles farther to the eastward, and the fall of rain therefore should have diminished rather than increased as we proceeded inland; but, as I have already noticed, the groups and chains of mountains commence at that place, and they become more numerous and higher as we approach the main line of ghats.

The increase therefore, in the fall of rain at Puttnapooram, and from thence to Caldoorty, I should be disposed to ascribe almost exclusively, to the obstruction offered to the passage of the vapour over these high chains of mountains, and to its consequent condensation, and in no way to any effect of the forests.

Very remarkable examples of this effect of continuous chains of high land, in arresting and condensing the passage of the vapour have been recently afforded in the tables of the fall of rain on the Mahabaleshwar hills, at Mercara in Coorgh, and on the table land called Uttree Mullay, in the chain of ghats east of Trevandrum, and published in the proceedings of the British Association for the advancement of science—all of these places being from four to nearly five thousand feet above the sea.

Uttree Mullay is a continuous mass of high land, running for several miles nearly parallel to the coast, in the latitude of Trevandrum, and upwards of 4,500 feet above the sea. While the fall of rain at Trevandrum is only from 50 to 60 inches,—on Uttree Mullay it is not less than, from 240 to 280 inches.

The slopes of the mountains are clothed with forests of tall trees, but on the summit, although with much wood, the trees are comparatively dwarf and stunted.

Dalton with reference to the effect of mountains in augmenting the fall of rain observes, that "the inferior, warm, and vapoury strata of air, striking against the mountains, are made to ascend into the colder regions, by which means the vapour is precipitated; the situation of places however, may be too high to experience an extreme in this respect, thus the rain in Switzerland and amongst the Alps is not probably greater than the north of England." So Ootacamund on the Neilgherries, where the rain is under 50 inches, would seem to be "too high;" it is above the ordinary plane of precipitation, or lower stratum of cloud vapour; besides which, it is 15 miles east of the line of ghats, and 770 miles from the sea coast; whereas, Uttree Mullay is only 22 miles from the sea and immediately on the western crest of the ghats.

The county of Cumberland in England also affords some interesting illustrations of the effect of mountain masses, in arresting and condensing the vapour:—In a paper by Mr. Miller, of Whitehaven, on the fall of rain in the lake districts of that county, he shows, that the fall in 1844-1845 at Gatesgarth, close into the mountains was 88½ inches, and at Seathwaite in Borrowdale, 56 inches in 7 months, (equal to upwards of 100 inches in the whole year)—while in the more open parts of the county at Keswick and Whitehaven, the fall was only 44 and 38 inches respectively.

23. The second line of rain observations is from between Alleppy and Cochin on the sea coast, nearly east to Thodawully, at the base of, and to the Perreyaar river, &c. on the central or cardamom table lands of Travancore, with rain guages as follows:

	Distance.	Altitude.	Rain.
	Miles.	Feet.	Inches.
Alleppy and Cochin, (mean)	Sea Coast	12	100
Thodawully,	30	120	142
Perreyaar river, On the Table Land	50	2500	84
Top of Cummum Pass, On the Table Land	60	3500	38

From Cochin to Thodawully is in the low country, but on leaving Thodawully, which like Pathanapooram is just at the commencement of the spurs and ridges running out from the main chain of ghats,—you ascend a very beautiful and extended table land, the first station on which is at the Perreyaar river in the very centre of the upper country; the 2d station Cummum is on the eastern crest of the table land, overlooking the low country of Dindigul.

The fall of rain at Thodawully at 30 miles from the sea is even greater than that at Caldoorty on the Quilon line at 40, but the fall of rain appears to increase as we go north, on the sea coast, as well as inland, and the actual difference here, between the coast and the inland stations, is less than on the Quilon line, as might be expected from the spurs and ridges from the main chain of ghats being of less depth and less altitude.

At Shalakurray, 30 miles from the sea, the fall is nearly double that at Quilon,—whereas at Thodawully, also 30 miles from the sea, the fall is barely half more than at Cochin or Alleppy.

A third series of observations is about 35 miles north of Cochin from the sea coast, near Chowgat by Trichoor to the town of Chittoor in the Cochin district of the same name, and in the very midst of the great opening in the ghats at Palghatcherry.

I have no observations at Chowgat, but have assumed that it is the same as at Cochin thus:

	Distance.	Altitude.	Rain.
	Miles.	Feet.	Inches.
Chowghat,	Sea Coast	12	88
Trichoor,	12	50	101
Chittoor,	52	300	60

I was not prepared at first to account for the greater fall of rain at Trichoor, 12 miles inland, for the country immediately about it is flat and open, but there are numerous and continuous high chains of hills crossing the whole country, to the eastward, within 5 or 6 miles; and it may therefore be considered as another and most interesting proof of their effect, in augmenting the fall of rain.

On the two former lines the fall of rain increased as the mountain tracts were approached and entered, but on this last line the very reverse takes place, the fall of rain at Chittoor 52 miles from the sea being only 60 inches, or but little more than one half of the fall on the coast; but on this line, although crossed by a belt of forest, there are no mountain chains to intercept and lead to condensation of the vapour, and which is of course therefore rapidly absorbed by the dry and heated air of the province of Coimbatore on the east of the ghats.

There cannot perhaps be a more beautiful illustration of the effect of mountain chains, in arresting and condensing the vapour, than the generally luxuriant forests which clothe the eastern as well

as the western ghats, but which cease almost immediately on quitting those chains. The forests on the east coast as might be expected, are less lofty and luxuriant than those in Malabar, not only from the fall of rain on the east coast being only half that of Malabar, but also because they are in general double the distance from the sea, the chief source of all vapour.

There can of course be little question as to the effect forests must have during a great part of the year, in preventing the dissipation of the superficial moisture, but I should doubt if that circumstance can have much influence on the supply of water from springs. The effect of the sun's rays on the earth, even when fully exposed to them, is sensible to but a very inconsiderable depth from the surface, and not at all so far as the subsidence of the water forming springs. The copiousness of springs must be influenced so much by a variety of other causes, as to render the effect of forests hardly appreciable. The vicinity to elevated table lands and mountains and hills, the nature of the rocks, and inclination of the strata, the general slope of the country, the absorbent qualities of the soil, &c. &c. must all have the most important influence. At Trevandrum, even on eminences, the wells at a depth of 40 feet from the surface rise occasionally several feet with a fall of rain of only the same number of inches, and within two or three days after heavy falls.

In the forests of this coast and above the ghats in the western parts of Mysore, Wynaad, and Coorgh, the trees are I believe every where nearly destitute of leaves, during the early part of the year, the driest and the hottest season, so that, even in forest tracts, the earth is at that period exposed to nearly the full force of the sun's rays.

The long grass and low jungle is also generally burnt down in these months, and the general heat and dryness in passing through such tracts are frequently intolerable. The almost entire absence of moisture and springs in forest tracts in the dry season is well known.

The district of Ernaad in Malabar, formerly so celebrated for its teak forests, and still I believe with much forest of other kinds, is I believe for the most part a plain and nearly level, but in the hot season is like the other tracts, I have noticed, equally destitute of vegetation and moisture, and I speak of these facts from having, although many years ago, passed over all the tracts in question.

The forests in this quarter therefore, whatever beneficial effects they may have during the rains or cooler portions of the year, would seem to exercise but little influence on the general climate, or in the preservation of moisture, at the very season when it is most required.

If forests maintain a lower temperature during the day, they equally prevent direct radiation, and induce a higher temperature during the night, while they must always be pervious to the strong and dry winds that prevail during one season of the year.

The Ceded Districts, meaning thereby chiefly the Collectorate of Bellary, although in the very midst of the Peninsula, and its capital, at least, 200 miles from either coast, in a country also nearly destitute of forest tracts and mountain chains, and 1,600 feet above the sea, is hardly a drier climate, or with less rain than the province of Tinnevelly, which is hardly above $\frac{1}{4}$ the above distance from either coast, frontiered by the chain of ghats, and with more forest or jungle tracts, and not above 200 feet above the sea.

The average annual fall of rain at Bellary is about 20 inches, but has occasionally been as little as 8 or 10 inches.

The fall of rain at Bellary was in		
1822........24 inches.		At Palamcottah the
1823........ $7\frac{1}{2}$,,		average is........26 inches.
1824........$19\frac{1}{2}$,,		But in 1848 there
1828........$24\frac{1}{2}$,,		was only about......15 ,,
1838........ $9\frac{1}{2}$,,		

The fall of rain at Coimbatore was in

1845........23 inches.	1846 ....$13\frac{1}{2}$ inches.
1847.........34 ,,	1848... ....$19\frac{1}{2}$,,

These two districts, to which may be added Coimbatore, appear to be, as far as regards the fall of rain, the driest perhaps under the Madras Presidency, or perhaps in any part of our Indian Empire, with exception of Scinde.

But small as is the fall of rain in the district of Bellary, the springs of water are I believe abundant, the slope of the country and the nature of the strata being favorable to their development. I recollect in the country about Raidroog, 40 miles South of Bellary, large holes were every where sunk from 25 to 30 feet deep, through the disintegrated and decomposed gneiss, where copious springs abounded, and carrying off channels from thence, the water was

brought (by the natural slope of the ground) to the surface within a few hundred yards, and fine streams obtained for irrigation even in the month of April. These springs were neither the result of forest tracts, nor of the condensation of vapours by elevated mountain chains, but had their origin in the mass of elevated land to the west of Raidroog which is some hundred feet higher, and some remarks on which, and the Soondoor mountains, I submitted to Government in my report of 21st October, 1846.

Dry and hot as the climate of Bellary has been considered, and disagreeable as it certainly is during the hot months of May and June, I do not observe such differences in the actual temperature, &c. as might perhaps have been supposed to exist.

From some observations made in the year 1824, I find the mean temperature to be in the month of:

		5 A. M.	3 P. M.	
	April	76°	91½	hot season.
	May	79°	93½	
While, at Madras, in	June	81½	91½	hot season.
	July	81½	91½	

The comparative low temperature with light westerly air at day-break at Bellary is, if I recollect correctly, a remarkable feature in its climate. It seemed to me to be caused by the strong sea breezes on the western coast at that season, and which reaching Darwar by the afternoon or evening, at the rate of 12 or 15 miles per hour, arrives at Bellary in the middle of the night or towards morning, where the rapid absorption of the vapour necessarily produces a fall of temperature.

I have traced the strong sea breezes of the Malabar coast nearly all across the Peninsula on different lines. At Seringapatam we used to look anxiously for its approach in the months of April and May, and where it generally arrived nearly as at Darwar about 8 or 9 P. M., causing an instant rise of several degrees on Saussure's hair hygrometer, and most agreeable to the feelings.

For instance in 1828:

		Temp.	Saussure's Hair Hygror.
17th March at	5½ P. M.	87°	7°
	9	84°	51°
14th May	5¼	88°	18°
	8¼	85°	54°

The arrival of the sea breezes from the Malabar coast may also be noticed occasionally at Bangalore, in the months of April and May, sometimes early in the night, but more generally towards morning.

Between Sedasheaghur and Mangalore the line of ghats is every where, I believe, of but moderate altitude, not probably any where above 2,000 feet, and without high chains of mountains, so that the sea breeze can pass over them at that season without any material obstruction, and to the influence of these moist breezes from the sea may possibly in part be ascribed the success of the cotton cultivation experiments to the west of Darwar.

These are points to which I have not observed that very much attention has been given, or at least few observations recorded. The temperature of the different seasons has been attended to, but not so much so I think the fall of rain, or the degree of humidity in the atmosphere. The climate of the southern or cotton districts of America, New Orleans and Florida, is noticed by Dr. Forry as remarkable for its equable temperature as well as its extreme humidity.

He says " This remarkable equality in the distribution of temperature among the seasons in Florida, compared with the other regions of the United States, constitutes its chief climatic peculiarity."

In regard to humidity, he adds :

" That the air is much more humid than in our more northern regions is sufficiently cognizable to the senses." The deposition of dew even in the winter is generally very great. To guard against the oxidation of metals " as for instance surgical instruments, is a matter of extreme difficulty. During the summer, books become covered with mould, and keys rust in one's pocket."

How different must be the climate of our Indian Cotton districts of Bellary, Coimbatore, and Tinnevelly.

The tables of rain in the foregoing papers are original, and the first I believe of their kind. They were set on foot, as I have already noticed, without the view of explaining any particular theory of climate. The extraordinary quantity of rain that fell on the high table land of the ghats near Trevandrum first drew my attention to the subject, and the theory of the condensation of the vapour caused by the mountain chains seemed to offer so perfect an explanation that I sought for no other. A farther investigation of the subject sug-

gested by the inquiries of the Honorable the Court of Directors, has not led me to attribute any very great influence to forests in the production of rain, but my remarks of course apply chiefly to the peculiar physical features of these two provinces of Travancore and Cochin, so remarkable from their great mountain barriers running parallel to the sea coast for 200 miles, intercepting the course of the monsoon, and no where above 40 miles distant, and the intermediate space towards the sea covered with innumerable high ridges and spurs from the main chain.

It will be observed from the letter of the Dewan of Cochin, that like myself he does not appear to have perfectly understood the meaning of the Court's queries as to how far the clearance of forests affected the moisture or productiveness of the soil. On inquiry I find that he merely contrasts cultivation under the shade of forest trees, with that on the same lands when cleared of forest. In the one case the growth of grain is rank and does not ripen, while in the other from the freshness and richness of the natural manure from decayed vegetable matter, it is vigorous and productive and in the same way that while the lands covered by forests are almost invariably wet and moist, after being cleared the moisture disappears.

These were results however, which few would question. My doubts were whether the Court adverted to the effect of extensive clearances on the lands previously under cultivation, to the general effect on the climate, on the fall of rain and on the original sub-stratum or sources of spring water, or whether it was meant to apply to the productiveness of the forest lands when recently cleared, compared with the productiveness of the same lands several years afterwards.

Of course from land cleared of dense forests the superficial moisture will be more speedily dissipated by evaporation, and when the same lands are brought under cultivation there must also be a corresponding local expenditure of water from the springs or rivers or other sources especially in warm climates.

This will lead probably to a partial and local (apparent) diminution of such sources of supply, but it can rarely I think materially affect a climate. The water that is evaporated, or absorbed by cultivation, will in the one case be ultimately restored to the land

by the periodical rains, and in the other will add by percolation to the supplies of lands on a lower level.

The wetness of the land said to be so remarkable in the extensive tracts of forests that cover a large portion of the interior of South America, I should be disposed to ascribe less to the obstruction offered by the abundance of decayed vegetable matter on the surface than to the want of slope in the soil to carry off the rain water.

The plains of the river Amazon at 3,000 miles from the Atlantic are stated by Humboldt to be not more than 1,200 feet above the sea, giving a slope of only $4\frac{3}{4}$ inches per mile in a direct line, and not probably half of that by the course of the rivers. In the south of India the slope will seldom I believe be found less than 4 or 5 feet per mile on a direct line.

I have the honor to be, &c.

RESIDENT'S OFFICE, *Cochin*, 31*st March*, 1849.

W. CULLEN, M. G.,
Resident.

P. S.—About the same time that I received the order of the Government to prepare this report, I also received a similar communication from the Board of Revenue requesting my opinion on the question; and as I observe that the Government have entrusted to that Board the duty of drawing up a general report on the subject, I hope I shall merely have been anticipating the wishes of the Right Honorable the Governor in Council, in transmitting direct to that Board a copy of this communication.

Original Tables of the fall of Rain, by General CULLEN.

QUILON TO PALAMCOTTAH.

Miles	25	30	36	41	52	70
	Quilon.	Puttana-pooram. 150 Feet.	Shala-curray. 100 Feet.	Koraven-tavalum. 350 Feet.	Caldoorty. 750 Feet.	Shencot-tah. 600 Feet.	Palam-cottah. 150 Feet.
	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.
1844	60	102	113	115	123	24	11½
1845	62	83	88	112	114	43	25½
1846	74½	98	103	97	136	41½	18
1847	83½	132	123	134	158	70	47
1848	46	79	103	106	106	32½	15
Mean..	65	99	106	113	128	42½	24

	Alleppy to Cummum. Miles.... 31	50	60		Chowghat to Chittoor. Miles....14	12	52	
	Alleppy.	Thoda-wully. 120 Feet.	Perreyar river. 2500Feet.	Cum-mum. 3500Feet.	Cochin or Chow-ghat.	Shala-coody. 50 Feet.	Trichoor 50 Feet.	Chittoor 300 Feet.
1844	119	143	—	—	102	—	110	58
1845	98	133	81	42	93	91	115	61
1846	113	150	113	42	106	90	114	52
1847	131	172	—	—	125	87	112	77
1848	85	115	57	30	76	30	52	53
Mean..	109	142	84	38	88	72	101	60

	Cape Comorin. 63 Feet.	22 Uttree Mullay. 4600 Feet.	Trevan-drum. 120 Feet.
1844	19½	—	47
1845	18	290	62
1846	56	236	69
1847	46	262	79
1848	24	209	41
Mean..	35	249	59½

W. CULLEN, *Resident.*

Copy of a Letter from the Dewan *of* Cochin.

No. $\frac{439}{1847}$.

To Major General W. Cullen, *British Resident of Travancore and Cochin.*

Sir,—I have the honor to acknowledge the receipt of your letter No. 1484, under date the 21st October last, with its enclosure (copy of a letter from the Secretary to the Government of India to the Secretary to Government Fort St. George, and also one from the Hon'ble the Court of Directors), and in reply to state, that it does not appear that there have been any such extensive clearances of forest in the Cochin country as to affect or influence the fall of rain.

Clearances, however, have taken place in different directions to a limited extent from one to four miles, and have been in every instance followed by decreased moisture and an increased productiveness in the soil.

I have the honor, &c.

(Signed) Shungra Warrier, *Dewan.*

Huzzoor Cutcherry, Ernacolum, in Cochin, 8th December, 1847.

The letter from the Reverend Mr. Mault of Nagercoil, I have mislaid, but its purport was, that he was not of opinion, that any clearances of forest had taken place during his residence of near 30 years in the south of Travancore, to an extent that could in any way affect the climate—but he joined in the very general opinion, that forests promoted and preserved moisture.

W. CULLEN, *Resident.*

Extract from Minutes of Consultation.

Para. 1. The question at issue in the correspondence that has passed upon the subject is, whether " the clearing of extensive forest lands is not likely to cause a diminution in the quantity of rain and thereby a failure in the sources from which the springs are supplied." The report, which is otherwise important and interesting, does not appear to supply any specific data on these points, and although chiefly applicable to a peculiar region where rain is certain, it yet presents some anomalies as to quantities in the same parallels inland which do not appear to be accounted for. The Right Honorable the Governor in Council finds much valuable matter which may be turned to account by those taking an interest in the subject, and he resolves in pursuance of the intentions declared in Extract Minutes of Consultation, dated 8th September, 1848, No. 981, to have Major General Cullen's report printed and distributed in the same manner as the paper by Dr. Balfour, to induce those who have already written to lay before Government any further suggestions which may occur to them, as well as to enable those who have not so written, to avail themselves of the information it affords and mature their views.

2. As a copy of the Report is before the Board of Revenue, they will be requested to notice it with the other communications they may receive on the same subject.

3. The Governor in Council resolves to furnish to Major General Cullen a copy of the foregoing proceedings, and to convey to him at the same time the thanks of Government for his valuable and interesting communication.

A true extract.

H. C. MONTGOMERY, *Secretary to Govt.*

Report of Surgeon C. I. Smith, *of the Mysore Commission, on the effect of Trees on the Climate and Productiveness of a Country.*

To the Secretary to the Commissioner for the Government of the Territories of His Highness the Rajah of Mysore.

Sir,—I have the honor to forward for submission to the Commissioner, the following observations on the influence of trees in modifying and altering climate, and more especially in regard to the effect of their clearance in diminishing or otherwise the annual supply of rain.

In Mysore there has not been any clearance of wood to an extent sufficient to bear upon the question, and in the absence of meteorological observations in the jungly districts, we must avail ourselves of the only other mode of gaining information, viz., popular opinion. The superintendent of Coorg, in answer to a Circular from the Commissioner's Office, writes as follows: "They (the Coorgs) are fully impressed with the belief that to clear them (the jungles) extensively, would tend greatly to diminish the quantity of rain and of water in the rivers, and thereby destroy their paddy cultivation, the principal produce of Coorg, and also render the inhabitants less healthy,— thus it will be observed, that the general belief mentioned in the 3d para. of the Honorable Court's despatch, extends itself to the Coorgs."

The only part of Coorg that has been recently cleared is a small district on the west bank of the Cauvery, around Kooshalnuggur, for the purpose of establishing a cantonment for the corps of Sappers and Miners,—the influence of this small clearance on the falls of rain has not been remarked.

The opinion of the superintendent of Nuggur is, that the clearance of trees diminishes the quantity of rain,—speaking of the clearances and the destruction caused by coomri cultivation, he says "it causes the most rapid destruction of the forests, which, it is a well ascertained fact, lessens the quantity of rain and moisture, and must thus in the course of no very long time seriously affect the cultivation and prosperity of the country."

The superintendent of Chittledroog writes as follows: "There is not much scope for forming an opinion founded on experience and observation within the limits of this division as respects the influence of trees on rain; there are no forests or extensive jungles, or ranges

of high and wooded hills; there is, however, a difference in the features of Chittledroog or the northern division, and the Toomcoor or southern division of this district; there are very few large trees, and but limited garden cultivation on the Chittledroog side, while trees are numerous, and garden cultivation extensive on the Toomcoor side;—in the former locality, there are occasionally wet seasons, and heavy falls of rain, but the quantity of rain generally falls far short of the supply in the latter locality; in the absence of the data afforded by the clearing of a forest or the extensive cutting down of trees, or the restoration of such, it would be difficult to decide whether extensive garden cultivation and planting of trees has originated in, or produced, the more abundant supply of water; but I am inclined to adopt the latter conclusion."

The above extracts show that the opinions of the superintendents, and of the natives of this country, are in favor of the notion that the presence of trees in a country tends to increase the quantity of rain. One passage in the superintendent of Chittledroog's letter is worth notice, viz., that heavy falls of rain are frequent in the Chittledroog or northern part of his district. In that part of the country are barren ranges of granite hills, which, it is not unlikely, attract electric clouds accompanied by torrents of rain. The heaviest falls of rain in Mysore are in October and November during the north-east monsoon, and these showers are always accompanied by thunder and lightning.

On the 4th of October, 1846, an extraordinary storm of this sort broke over the hills to the north of Toomcoor, in the Chittledroog district, 10 inches of rain fell in 4 hours, and burst the bunds of nearly all the tanks over a range of 80 miles. The presence of trees appears in some way to modify these sudden bursts of rain and to equalize the falls, as similar thunder storms are common in the immediate neighbourhood of Seringapatam, where rocks are abundant and verdure scanty. The talooks in which most rain falls, apart from the hill country, are exactly those in which are the largest amount of jungle, Shemogah, Chennagherry, Terrikerry, and again down to the south in Heggadadavencottah and the talooks skirting the Coorg jungles and hill country, and then inland following the line of hills which runs from the Neilgherries and separates Mysore from Coimbatoor. In the Bangalore division, or eastern district of Mysore, the line of jungles from Severndroog to the Cauvery, including

the talooks of Closepett, Kankanhully, and Harohully, receive the most rain,—except these last named talooks in the Bangalore division, the others are all either bordering on lines of hills clothed with jungle or have extensive tracts of jungle which may fairly be supposed to influence the quantity of rain.

I have appended to this report a return showing the quantity of rain measured at particular spots in the four districts of Mysore for the last 12 years, a reference to which will show how little can be deduced from such varying results. The whole of the observations were taken in the open country. Rain gauges kept at a distance of 2 or 3 miles vary remarkably in the quantities measured, observations of this sort may, however, become valuable if taken for a series of years in different parts of India with similar instruments, as by comparing the quantities of rain measured in jungly and open districts, an approach may be made to some certain results.

In the Mulnaad and Coorg the quantity of rain that falls is very great, and to what can we attribute this, but to the influence of the ghauts and hilly country inland covered with dense jungles, which attract and retain the largest portion of the south-west monsoon. Bellary, Seringapatam, and Ootacamund are nearly in the same parallel of longitude, but at different distances from the line of ghauts, and to this circumstance we may attribute the difference in the falls of rain at these stations.

Assistant Surgeon Balfour, in his notes on this subject, has well remarked "that the observations of scientific men support the belief that a mutual reaction goes on between these two physical agents and that the presence of trees greatly adds to the supply of water and feeds the running streams." The instance of a single district losing its supply of water on being cleared of forest, and regaining it again when restored to its original state, would not alone establish more than strong presumption that the clearing of the forest and the loss of rain followed each other as cause and effect; but the Honorable Court of Directors, in their circular, mention that this is not uncommon in America.

On the subject of springs, Assistant Surgeon Balfour quotes from Jameson's Edinburgh Philosophical Journal, a very remarkable instance at Popayan in Peru, of a district losing its supply of water from the clearance of the forest. Two instances corroborative of the

above have come under my own observation, and happened to friends in different parts of the country engaged in coffee planting. The first happened in a range of hills south-east of Bangalore, at a coffee plantation now called Glenmore in the Debenaicottah talook of the Salem district. The proprietor when preparing ground for a coffee garden which was watered by an excellent spring, was warned by the natives not to clear away the trees in the immediate neighbourhood of his spring,—he disregarded their warning, cut down the trees and lost his stream of water. The other instance happened at the village of Hoolhully about eight miles distant from the head of the new ghaut in Mungerabad, I wrote to the gentleman to whom it occurred, who answered as follows : " The cutting down trees and clearing jungle on the sides of ravines in the close vicinity of springs, undoubtedly has a great effect in diminishing the quantity of water. I found it so in one or two instances in ravines I have cleared for planting—at one place where I had a nursery, which I used to water by turning a water course from the spring, I found that since I cleared up the sides of the ravine in which the spring is (for planting), I have not any thing like the quantity of water I had before the shade was cleared. I presume this is to be accounted for by the increased action of air and sun,—at any rate, the natives about here are of that opinion. I leave the cause, however, to be settled by more scientific men than myself,—that the effect is so, there is no doubt. A ravine close to the bungalow where there is a spring, a few years ago I cleared for planting, and found the water decrease in like manner ; but the coffee trees dying away, and the place being too small for a plantation, I did not renew them, but allowed the jungle to grow up again, since which the stream has nearly regained its former size."

The superintendent of Nuggur writes " that springs of water shaded by trees almost invariably dry up, on the trees being cleared away. This has been observed on the Neilgherry hills and many other woody districts." In what way trees influence springs it is impossible to say; that they do so, seems to be established, as also that they condense and attract vapour.

I cannot omit inserting at length the quotation from White's History of Selborne, part of which is alluded to by Mr. Balfour. " In heavy fogs, on elevated situations especially, trees are perfect alembics ; and no one that has not attended to such matters, can imagine

how much water one tree will distil in a night's time, by condensing the vapour, which trickles down the twigs and boughs, so as to make the ground below quite in a float. In Newton Lane, in October, 1675, on a misty day, a particular oak in leaf dropped so fast, that the cart way stood in puddles and the ruts ran with water, though the ground in general was dusty. In some of our smaller islands in the West Indies, if I mistake not, there are no springs or rivers, but the people are supplied with that necessary element, water, merely by the dripping of some large tall trees, which standing in the bosom of a mountain, keep their heads constantly enveloped with fogs and clouds, from which they dispense their kindly, never ceasing moisture; and so render those districts habitable by condensation alone. Trees in leaf have such a vast proportion more of surface than those that are naked, that in theory, their condensation should greatly exceed those that are stripped of their leaves, but as the former imbibe also a great quantity of moisture, it is difficult to say which drip most; but this I know, that deciduous trees that are entwined with much ivy, seem to distil the greatest quantity. Ivy leaves are smooth, and thick, and cold, and therefore condense very fast; and besides ever-greens imbibe very little. These facts may furnish the intelligent with hints concerning what sorts of trees they should plant round small ponds that they would wish to be perennial, and show them how advantageous some trees are in preference to others. Trees perspire profusely, condense largely, and check evaporation so much, that woods are always moist; no wonder, therefore, that they contribute much to pools and streams. That trees are great promoters of lakes and rivers, appears from a well known fact in North America; for since the woods and forests have been grubbed and cleared, all bodies of water are much diminished; so that some streams, that were very considerable a century ago, will not now drive a common mill. Besides most wood-lands, forests, and chases, with us, abound with pools and morasses, no doubt for the reason given above. Again, Dr. Hales in his vegetable statics, advances from experience, that the moister the earth is, the more dew falls on it in a night; and more than a double quantity of dew falls on a surface of water, than there does on an equal surface of moist earth. Hence we see that water, by its coolness, is enabled to assimilate to itself a larger quantity of moisture nightly by condensation,

and that the air when loaded with fogs and vapours and even with copious dews, can alone advance a considerable and never failing resource. Persons that are much abroad and travel early and late, such as shepherds, fishermen, &c. can tell what prodigious fogs prevail in the night on elevated downs, even in the hottest parts of summer, and how much the surfaces of things are drenched by those swimming vapours, though, to the senses, all the while, little moisture seems to fall."

In Coorg and the hill country, it is impossible to move off the road when walking early and before the sun has dried the ground, the dews are so heavy, and the dripping from the trees so wetting, yet the roads are perfectly dry. Some crops in India, as the cooltie, depend entirely on the fogs for sufficient moisture to mature a crop.

In paras. 31 and 32 of General Cullen's report, he says, "In the forests of this coast and above the ghauts in the western parts of Mysore, Wynaad and Coorg, the trees are I believe every where nearly destitute of leaves, during the early part of the year, the driest and the hottest season, so that even in forest tracts, the earth is at that period exposed to nearly the full force of the sun's rays."

"The long grass and low jungle is also generally burnt down in these months, and the general heat and dryness in passing through such tracts are frequently intolerable. The almost entire absence of moisture and springs in forest tracts in the dry season is well known."

And at para. 34 he says, "The forests in this quarter therefore, whatever beneficial effects they may have during the rains or cooler portions of the year, would seem to exercise but little influence on the general climate, or in the preservation of moisture, at the very season when it is most required." General Cullen's recollection of these tracts is not in accordance with my experience of them. I was in the north of Coorg in December last and in Munzerabad in January of this year, and in January, 1847, it is true that the grass is generally fired, but very few of the trees are deciduous and even at that dry season of the year most of the deciduous trees were in full blossom, and preparing to throw out their spring crop of leaves. It is in the hottest season of the year, March and April, that the mangoe throws out its blossoms and young leaves, maturing its fruit in June; from what source does it derive the requisite moisture, to carry on the process of maturing its crop? In the months I

have mentioned, and in the districts in question, it was impossible to move off the roads till the sun had dried up the dew with which the grass and brushwood in the jungles was daily saturated. On the Baba Booden hills in April, 1848, the hottest season of the year, I found the fog so dense till 8 or 9 A. M. and the condensation of water on the trees in the jungles so great, that I used to be wet through in moving through them.

About 37 miles north of Bangalore is the range of hills of which Nundydroog forms the most conspicuous object; some friends encamped at the foot of these hills, were at a loss to account for the circumstance that Nundydroog was often clear of vapour, when two other hills close to it were covered with a cloud, nor were they able to account for it, till on ascending these hills, they were found to be covered with a stunted vegetation, from which Nundydroog was free. When encamped on Nundydroog, I observed rain frequently fall on those opposite hills, apparently avoiding the one on which I was. Doctor Darwin supposes that as the summits of mountains are much colder than the plains in their vicinity, they condense the vapours more readily, and so contribute to form springs; supposing Dr. Darwin's theory to be true, which I have no doubt it is, the condensation produced by the cold top of Nundydroog actually higher than the neighbouring hills, was more than counterbalanced by the circumstance of the others being clothed with verdure. The presence of springs near the top of insulated granite hills as Nundydroog, Sivagunga, Severndroog, and in fact on most of the insulated hills in Mysore, is not easily accounted for. These hills are insulated and rise out of the plain from 15 to 1800 feet, the base surrounded with blocks of granite. It is difficult to suppose that the causes we have been enumerating as influencing springs, can have any perceptible effect on those which are found under the lower strata, in Bangalore as deep as 50 feet,—for the sources which supply these, we must look to other causes.

I have the honor to be, &c.

BANGALORE, 23d *June*, 1849.

(Signed) C. I. SMITH, Surgeon,
Mysore Commission.

(True copy.)

M. CUBBON,
Commissioner.

Abstract of the monthly fall of Rain at Bangalore, from the year 1837 *to* 1848.

Months.	1837. Rain Gauge.	1837. No. of days in each Month.	1838. Rain Gauge.	1838. No. of days in each Month.	1839. Rain Gauge.	1839. No. of days in each Month.	1840. Rain Gauge.	1840. No. of days in each Month.	1841. Rain Gauge.	1841. No. of days in each Month.	1842. Rain Gauge.	1842. No. of days in each Month.
January,........	......	..	......	..	·55	3	......	..	....	....	......	3
February,........	......	..	......	..	......	..	......	..	....	....	......	..
March,.........	$\frac{3}{16}$	1	·45	1	·10	2	·20	2	1 slight	shower	......	1
April,.........	$1\frac{5}{16}$	2	·75	8	·85	4	·80	6	1·90	3	·6	4
May,...........	$5\frac{5}{16}$	13	2·70	8	6·95	9	7·65	13	2·95	10	2·20	9
June,..........	$3\frac{15}{16}$	13	1·85	7	3·75	8	2·40	8	1·90	10	8·25	10
July,..........	$4\frac{4}{16}$	14	drizzle	9	4·80	21	3·60	10	2·65	10	1·25	4
August,........	$6\frac{6}{16}$	18	4·5	10	7·20	19	5·35	7	10·35	18	2·61	12
September,.....	$1\frac{14}{16}$	7	3·40	8	4·10	14	5·40	10	8·90	16	10·50	15
October,.......	$10\frac{2}{16}$	13	1·15	6	3·85	9	4·50	12	8·0	16	5·40	6
November,......	$10\frac{7}{16}$	15	1·10	5	......	3	·30	5	1·30	4	·45	3
December,......	$1\frac{5}{16}$	2	......	1	·15	1	......	..	....	......	......	..
	$45\frac{3}{16}$	98	15·45	63	29·30	93	30·20	73	38·5	87	30·72	67

Months.	1843. Rain Gauge.	1843. No. of days in each Month.	1844. Rain Gauge.	1844. No. of days in each Month.	1845. Rain Gauge.	1845. No. of days in each Month.	1846. Rain Gauge.	1846. No. of days in each Month.	1847. Rain Gauge.	1847. No. of days in each Month.	1848. Rain Gauge.	1848. No. of days in each Month.
January,........	1·75	3	......	1	2·95	3	....	..	....	..	......	..
February,........	......	..	·35	2	....	..	·15	1	1·60	4	......	..
March,.........	1·60	6	·70	2	·45	4	....	..	....	1	......	..
April,.........	......	..	·15	5	2·75	8	·5	1	·85	5	2·65	8
May,...........	8·0	8	4·5	9	1·95	8	8·40	11	3·75	15	7·92	10
June,..........	3·45	10	1·40	7	7·30	12	1·85	12	1·20	8	1·70	12
July,..........	1·80	4	3·10	9	2·5	4	4·50	17	11·35	19	5·16	16
August,........	1·30	8	3·55	13	1·80	8	3·10	20	4·5	15	7·25	19
September,.....	6·15	11	6·70	9	9·5	10	7·0	12	3·50	3	11.50	13
October,.......	7·10	16	3·45	6	2·80	3	10·75	13	9·30	14	2·15	4
November,......	......	..	......	..	·30	2	2·90	4	1·55	7	1·40	4
December,......	5·45	7	4·45	10	·50	2	·75	2	·85	3	·50	4
	38·60	73	27·90	73	31·90	62	39·45	93	37	94	40·3	90

Register kept in the Cantonment of Bangalore.

Abstract of the monthly fall of Rain in the Nuggur Division, from the year 1837 *to* 1848.

Months.	1837. Rain Gauge.	1837. No. of days in each Month.	1838. Rain Gauge.	1838. No. of days in each Month.	1839. Rain Gauge.	1839. No. of days in each Month.	1840. Rain Gauge.	1840. No. of days in each Month.	1841. Rain Gauge.	1841. No. of days in each Month.	1842. Rain Gauge.	1842. No. of days in each Month.
January,	......	..	......	..	......	..	......	..	......	..	......	..
February,	......	1	......	1	......	..	......	..	......	..	......	..
March,	......	7	....	2	......	..	......	2	....	..	......	..
April,	$\frac{5}{16}$	2	$2\frac{1}{4}$	6	$3\frac{3}{8}$	5	$1\frac{1}{3}$	10	.....	7	$\frac{1}{2}$	1
May,	$3\frac{3}{16}$	7	$1\frac{13}{16}$	8	$3\frac{7}{16}$	8	$2\frac{1}{4}$	4	$3\frac{5}{10}$	4	$2\frac{1}{4}$	2
June,	$1\frac{1}{8}$	8	$1\frac{15}{16}$	11	$1\frac{12}{16}$	9	$5\frac{9}{16}$	8	$2\frac{9}{16}$	3	$6\frac{15}{16}$	9
July,	$2\frac{7}{16}$	12	$2\frac{1}{4}$	11	$7\frac{1}{4}$	24	$9\frac{6}{16}$	15	$3\frac{3}{16}$	6	$7\frac{9}{16}$	17
August,	$3\frac{3}{16}$	17	$2\frac{15}{16}$	13	$4\frac{3}{16}$	17	$\frac{10}{16}$	4	$3\frac{7}{16}$	9	$3\frac{12}{16}$	7
September,	$6\frac{1}{8}$	13	$2\frac{1}{8}$	10	$3\frac{1}{16}$	7	$\frac{1}{2}$	2	$\frac{12}{16}$	6	$8\frac{1}{8}$	10
October,	5	11	$1\frac{3}{8}$	5	$5\frac{11}{16}$	7	$3\frac{10}{16}$	7	$10\frac{3}{16}$	14	$\frac{1}{2}$	1
November,	$8\frac{1}{2}$	15	$1\frac{13}{16}$	7	$1\frac{7}{8}$	1	......	..	$1\frac{1}{16}$	1	......	..
December,	$1\frac{9}{16}$	1	.....	..	.....	3	......	..	......	..	......	..
	$32\frac{1}{16}$	94	$15\frac{14}{16}$	74	$29\frac{11}{16}$	81	$23\frac{1}{16}$	52	$24\frac{11}{16}$	50	290	47

Months.	1843. Rain Gauge.	1843. No. of days in each Month.	1844. Rain Gauge.	1844. No. of days in each Month.	1845. Rain Gauge.	1845. No. of days in each Month.	1846. Rain Gauge.	1846. No. of days in each Month.	1847. Rain Gauge.	1847. No. of days in each Month.	1848. Rain Gauge.	1848. No. of days in each Month.
January,	......	..	......	..	·15	1	......	..	3·80	6	......	...
February,	......	.	......	..	......	.	·70	2			......	...
March,	......	...	......	..	·51	3	......	..	·35	2	......	...
April,	$3\frac{1}{4}$	7	·15	1	3·50	6	·10	1	3·35	4	3·40	9
May,	......	..	2·10	5	·20	1	1·70	5	7·15	9	5·75	16
June,	......	..	4·64	15	5·15	16	5·35	15	1·55	5	2·65	10
July,	1·65	15	6·41	24	5·10	8	8·48	20	1·75	8	5·5	12
August,	·51	4	4·4	16	2·50	14	4·60	19	·85	7	8·15	13
September,	4·50	11	5·55	8	5·65	10	1·55	9	·80	4	1·70	9
October,	5·45	9	5·35	9	·30	3	8·50	12	8·30	15	2·40	7
November,	......	..	......	..	2·0	2	1·5	1	3·5	4	·75	3
December,	......	..	2·0	6	·90	2	·20	1	......	..	......	..
	15·36	46	30·64	84	25·96	66	32·3	85	30·95	64	29·85	79

Register kept at the Town of Shemogah, except during the five months when the Cutcherry is on Jummabundy.

Abstract of the monthly fall of Rain in the Chittledroog Division, from the year 1837 *to* 1848.

Months.	1837. Rain Gauge.	1837. No. of days in each Month.	1838. Rain Gauge.	1838. No. of days in each Month.	1839. Rain Gauge.	1839. No. of days in each Month.	1840. Rain Gauge.	1840. No. of days in each Month.	1841. Rain Gauge.	1841. No. of days in each Month.	1842. Rain Gauge.	1842. No. of days in each Month.
January,	......	..	......	..	......	..	......	..	......	..	......	..
February,	......	..	......	..	$\frac{3}{8}$	1	......	..	......	..	......	..
March,	......	..	......	..	$\frac{1}{8}$	1	......	..	·62	1	·45	1
April,	......	1	$1\frac{7}{16}$	4	$3\frac{1}{4}$	3	$2\frac{1}{2}$	1	1·12	3	·80	2
May,	$4\frac{1}{8}$	7	$1\frac{7}{8}$	3	$3\frac{7}{8}$	6	$1\frac{15}{16}$	5	2·70	3	3·55	7
June,	$1\frac{9}{16}$	1	$1\frac{3}{8}$	1	$4\frac{7}{16}$	9	$2\frac{1}{8}$	6	3·55	9	4·65	6
July,	$2\frac{13}{16}$	5	$\frac{5}{16}$	2	20	7	$\frac{7}{16}$	3	·65	2	2·55	8
August,	$3\frac{3}{16}$	10	$2\frac{3}{16}$	8	$5\frac{15}{16}$	13	$1\frac{5}{8}$	5	4·35	11	3·10	7
September,	$1\frac{13}{16}$	5	$4\frac{5}{16}$	6	$8\frac{3}{8}$	11	$7\frac{7}{8}$	8	7·15	8	8·65	12
October,	$4\frac{3}{16}$	5	$2\frac{3}{8}$	3	$3\frac{3}{4}$	6	$5\frac{5}{8}$	9	8·60	17	3·55	3
November,	$9\frac{7}{8}$	11	[illegible]	1	$\frac{7}{16}$	3	$\frac{1}{16}$	1	·40	2	......	..
December,	......	..	......	..	$\frac{1}{8}$	1	......	..	......	..	......	..
	$26\frac{10}{16}$	45	$12\frac{1}{16}$	28	$32\frac{9}{16}$	61	$21\frac{11}{16}$	37	29·14	56	27·30	46

Months.	1843. Rain Gauge.	1843. No. of days in each Month.	1844. Rain Gauge.	1844. No. of days in each Month.	1845. Rain Gauge.	1845. No. of days in each Month.	1846. Rain Gauge.	1846. No. of days in each Month.	1847. Rain Gauge.	1847. No. of days in each Month.	1848. Rain Gauge.	1848. No. of days in each Month.
January,	......	...	......	..	·40	1	......	..	......	..	......	..
February,	......	...	......	..	......	..	......	..	3·50	5	......	..
March,	......	...	......	..	·30	2	......	..	......	..	......	..
April,	·95	4	1·30	4	1·10	3	·20	2	2·15	3	1·95	4
May,	8·30	9	4·30	8	4·0	7	8·30	7	5·95	6	7·5	7
June,	2·80	3	3·85	10	5·40	11	4·0	7	·40	1	·85	3
July,	1·45	2	3·75	9	·25	1	10·20	9	5·55	6	1·25	5
August,	2·20	4	1·5	3	·55	1	1·55	5	1·50	4	·65	1
September,	6·55	9	3·20	6	13·20	7	6·55	4	1·85	1	2·25	6
October,	18·10	17	5·40	5	·95	1	23·70	9	9·45	14	1·45	2
November,	......	..	......	..	·25	1	1·45	2	1·35	2	1·50	1
December,	1·75	4	2·50	5	......	..	·90	1	......	..	......	..
	42·10	52	25·35	50	26·40	35	56·95	46	31·70	42	16·95	29

Register kept *chiefly* at the Town of Toomcoor the Southern part of the District.

Abstract of the monthly fall of Rain in the Astagram Division, from the year 1837 *to* 1848.

Month.	1837.		1838.		1839.		1840.		1841.		1842.	
	Rain Gauge.	No. of days in each Month.	Rain Gauge.	No. of days in each Month.	Rain Gauge.	No. of days in each Month.	Rain Gauge.	No. of days in each Month.	Rain Gauge.	No. of days in each Month.	Rain Gauge.	No. of days in each Month.
January,	......	..	......	...	....	...	....	...	....	...	....	...
February,	......	..	....	...	....	...	....	...	....	...	1·25	2
March,	$\frac{1}{16}$	3	$2\frac{5}{8}$	2	....	3	....	...	....	...	....	...
April,	$\frac{14}{16}$	4	$3\frac{2}{8}$	5	....	5	....	...	$1\frac{1}{8}$	3	·37	1
May,	$3\frac{12}{16}$	9	....	11	....	9	$3\frac{5}{8}$	11	$4\frac{1}{16}$	7	2·90	8
June,	$2\frac{1}{16}$	5	$\frac{1}{16}$	1	....	5	$2\frac{1}{8}$	5	2	2	$4\frac{1}{8}$	8
July,	$\frac{10}{16}$	4	$\frac{3}{16}$	3	$\frac{1}{16}$	18	$1\frac{3}{8}$	9	$\frac{4}{16}$	3	$\frac{12}{16}$	5
August,	3	5	$\frac{7}{8}$	6	$1\frac{5}{8}$	10	$\frac{3}{8}$	3	$3\frac{1}{2}$	6	$3\frac{1}{2}$	9
September,	$3\frac{9}{16}$	8	$7\frac{5}{16}$	12	$3\frac{3}{16}$	11	$\frac{5}{16}$	2	$11\frac{7}{8}$	8	$3\frac{1}{2}$	7
October,	$5\frac{8}{16}$	10	$3\frac{1}{4}$	6	$5\frac{4}{16}$	11	$5\frac{3}{16}$	9	$7\frac{5}{8}$	10	$7\frac{1}{2}$	6
November,	$6\frac{1}{16}$	7	$1\frac{13}{16}$	4	$\frac{9}{16}$	4	$2\frac{7}{16}$	3	$2\frac{1}{8}$	3	....	...
December,	....	..	$\frac{3}{6}$	1	....	...	....	...	....	...	....	...
	25 [illegible]/16	55	$19\frac{11}{16}$	51	$9\frac{11}{16}$	76	$15\frac{7}{16}$	42	$31\frac{7}{8}$	42	23·89	46

Month.	1843.		1844.		1845.		1846.		1847.		1848.	
	Rain Gauge.	No. of days in each Month.	Rain Gauge.	No. of days in each Month.	Rain Gauge.	No. of days in each Month.	Rain Gauge.	No. of days in each Month.	Rain Gauge.	No. of days in each Month.	Rain Gauge.	No. of days in each Month.
January,	....	...	·10	1	1·3	3	....	...	....		....	...
February,	....	...	·15	1	·15	1	....	...	·30	1	....	...
March,	....	...	....	...	3·10	3	....	...	·15	1	....	...
April,	....	8	2·65	4	7·20	11	1·35	2	1·85	4	4·70	6
May,	2·25	8	9·35	11	10·75	9	4·35	8	5·90	10	4·55	8
June,	3·95	6	5·50	7	1·40	6	·25	9	·75	3	·45	2
July,	·90	3	2·90	7	·25	2	4·95	9	1·90	8	1·0	3
August,	2·0	5	1·35	5	·75	4	2·70	7	·45	2	2·55	6
September,	3·40	9	4·30	7	4·50	11	1·15	4	·55	3	8·25	16
October,	8·95	11	1·95	3	4·70	7	11·10	13	10·5	16	3·20	7
November,	....	...	·40	1	·40	1	1·55	3	1·50	8	2·20	7
December,	1·10	2	5·80	6	....	...	·5	1	1·45	4	....	..
	22·55	52	34·45	53	34·20	58	27·45	56	24·85	60	26·90	55

Register kept at the Town of Mysore, unless when the Cutcherry is on Jummabundy.

(Signed) C. I. SMITH, *Surgeon.*

(True copy.)

M. CUBBON, *Commissioner.*

III. *On the Cultivation of the Hurriallee Grass. Communicated by Colonel* Reid, C. B., *Secretary to the Agri-Horticultural Society.*

For the following valuable paper, on the cultivation of the " Hurriallee Grass," we are indebted to Major Ottley, Fort Adjutant at Vellore, on application being made to him, by the Agri-Horticultural Society of Madras, to assist them in meeting the wishes of Government, on behalf of Her Majesty's Colonial Government of Ceylon, to procure and forward (with the eventual view of transmitting from thence a portion for introduction into Her Majesty's Colonies of the Cape, New South Wales, &c.) either seeds, or roots of the grass, known at Madras as the "Dhoob" or "Hurriallee," and on which our horses are almost entirely foraged.

The grass in question is the *Panicum Dactylon*, of Roxburgh ; *Agrostis, linearis* of Linnœus; Telinga, *Ghericha;* Tamil, *Arugum Pilla*, and Hindoostanee, *Dhoob*. It is unquestionably the most valuable grass India possesses for forage, but its capabilities, as a hay grass, though partially known for years; have not been fully developed, until lately.

The grass, in its natural state (and it may be seen most commonly on every road-side) partakes of the character called creeping, the flower bearing branchlets alone, being erect, and these rarely arriving at a foot in height, and by no means abundant. It is to cultivation, therefore, that we owe its becoming a hay grass, and Major Ottley's paper shows to what perfection it can be brought; the grass, in favourite places in his ground, grows to the extraordinary height of from 3 to 4 feet and averages 2 feet throughout. The crops are so luxuriant that the space, on which the grass is grown, is not sufficiently large to work it on in the drying,—the lower part of the stalks being one complete entangled mass. The growth is so rapid, that, if requisite, nearly monthly crops could be taken, each acre producing a ton at a bearing, and each ton worth 30 rupees at least.

One of the most remarkable qualities of this grass, and, to us, certainly, one of the most valuable, is the fact of its rejoicing in the heat, the very best crops are produced in the hottest weather, and there can be no doubt, but that the hay of such crops will be sweeter and of a more nourishing quality, from the combined effects of the sun and

irrigation, than crops produced almost solely from the effects of the monsoon, without so much of the congenial warmth and ripening properties of the sun. It has occurred to me that a still more ready mode of cultivation than either of those mentioned might be adopted, viz., with the common country plough, let the planter follow immediately on the plough, and lay the roots lengthways in the furrow, the next plough buries the roots and makes a new furrow, which is again planted by a man following and so on, any number of ploughs and planters may be employed according to the expedition required, and the size of the ground; care should be taken to eradicate at an early stage any other description of grass or weed that may appear, and for this purpose the crop should frequently be carefully examined throughout. If weedy grasses should, in spite of every care, spring up, and be only discovered when in seed, remove the spikes carefully, and by so doing, you will at all events prevent their increase by seed, and can eradicate the plants thereafter in their early stage of sprouting.

It may here be added with regard to the success of the application to Major Ottley for seed, that by the last steamer two large bales of seed, in the ear, were forwarded to Ceylon, being the produce of Major Ottley's grass fields at Vellore and kindly forwarded by that Gentleman to Madras for the use of the Agri-Horticultural Society.

F. A. Reid,
Secretary.

Agri-Horticultural Society's Gardens, 22*d October*, 1849.

Vellore, 17*th July*, 1849.

I should be most happy to comply with your requisition for Hurriallee Grass seed, were it possible to obtain any: a crop of grass must be raised in the first instance, and when full ripe a collection of tops will furnish the requisite, and this shall be attended to, as soon as possible with great pleasure. No one in Vellore besides myself has ever attempted its cultivation, and for three years I had little success, although the ground was dug, cleaned, and manured to the fullest extent from pits 20 feet square and five feet deep of cow dung at least a year old, and all the watering was to little purpose, for it never exceeded six or eight inches in height; at the recommenda-

tion of a native I mixed potash to loosen the soil but it had the effect of destroying the roots, and to remedy this, I covered the whole surface with about 9 inches of light sandy stuff called wundul taken from the bottom of tanks adding to it plenty of dung, I planted again and the result was most favourable. Rice land is clayey and after irrigating cracks and is more or less one sheet of sun burnt brick, which precludes the roots from bifurcating, or shoots to spring up ; the condition of my ground will be best shown by a return of 8 crops last year of as fine hay as can be produced in any part of the world, averaging one ton a cawny, you have only to give me 30 days Law any month in the hot season, to furnish a specimen to the extent of 4 tons. I find the roots after a year get so thick and matted, that the grass cannot grow more than a foot, in fact the upper surface can only be compared to a coir rug, when this is the case it takes three days ploughing to get rid of the superfluous roots, and although one would fancy from the cart loads taken out that few roots would be left, still in about 10 days with a good flourish of manure which is thrown previous to the last ploughing, it will be found after levelling, ridges prepared 6 feet apart, and watering by the pecottah, that the plot is as green as ever, furnishing a good return, but still better the second cutting. The dry weather is more favourable to crops than the monsoons, too much wet is bad, and produces frequently myriads of caterpillars that devour all but the stem in a night or two. I only water twice, seed will answer very well but roots of a proper description throw you almost a year in advance of them. I attempted three modes of planting, first dibbling, sticking the roots up and down ; but this was too slow a process, so inundated the ground like a paddy field, and stuck them into the mud but neither plan answers so well as making long furrows with a mamoty three or four inches deep and laying the whole root in lengthways, for then every joint or knot throws out a shoot, and covering them prepares another trench so that two men cut along at a great rate, the principal part of my ground was really good for nothing and took 12 to 14 men a year to dig and clean an acre, for it was full of those horrible knotty weeds that have long fibres under ground called "Cangoo." I then dug a number of holes 2 feet deep, 4 in diameter, 5 feet apart and put into each 2 cart loads of fresh cowdung, and covered them with *wundul* and old manure, and, when the surface was all properly prepared, planted : and I found that the grass that grew over the

pits to be most luxuriant, when other parts seemed bare in comparison; although the produce throughout was splendid, this shows that the richer the soil, the better the crop. Quicklime as a manure is admirable stuff, in proof of which I deposited a cart load on the grass and threw a bamboo mat over it, in the course of three weeks the grass grew through the lime and mat, and it was with force alone it could be removed. Another experiment was to strew straw over a bed that had been watered for the last time, and the grass rose much higher than in parts where it was not applied.

A six dozen case would be a good mode of conveying fine, long, juicy hurriallee roots, first strew some fine fresh soil about $\frac{1}{2}$ an inch thick at the bottom and then deposit a layer of roots and then a sprinkling of earth and so on. I will answer for it they will be fresh after a considerable time if only kept damp.

In May and June I had excellent cuttings and the compound is now like a sheet of Paddy, and if you would like to send Lord Torrington a specimen, of what's now on the ground a bandy load shall be despatched to your address which you can get trussed at Parry and Co., and sent off by the Steamer—no other description of grass is allowed to show its head in my place. I take no pains to grow more than is wanted for my stud, nevertheless I can accommodate my friends with a little. From what I have offered it will be observed that it is quite useless attempting to cultivate this kind of grass, except in deep, rich, loose mellow soil, I manure from large pits that are always kept filled with cow dung and the tops covered with light earth to prevent evaporation of chemical properties. This is mixed yearly with wundul, lime and a sprinkling of salt, and a good layer is spread over the plots and ploughed in as before stated, all this expense is thrown away without you have capacious wells at convenient positions, say, for an acre and a half, to irrigate beds that must be nicely prepared, 6 feet broad and 30 long, with a gentle slope, so that the water may flow over them quickly ; larger beds are only to ensure loss of time, labor and water, and this bit of information was taught at a considerable cost, having had to diminish the size of all the partitions, three different times, for, I found it took all day to water the most trifling space, and, by the means suggested, half an acre can be flooded with a pecottah and pair of bullocks in 8 hours. The Bangalore hay is a mélange of all sorts, and I will back my com-

pound against any in Mysore for quality, quantity and length of produce, at any season of the year, as I believe no man in India has ever taken the same pains to bring this particular grass to perfection, and that for a period of five years. It is no doubt a description of couch grass, for it is equally difficult to extirpate, and the roots are generally found a foot from the surface, and the smallest particle left in the ground will shoot up. I return the several papers and am only sorry I have not had time to consider the subject in the manner I should wish, so excuse this hasty reply.

(Signed) C. G. OTTLEY.

IV. *Statistics of the Circar of Dowlutabad. By Surgeon* W. H. BRADLEY, *8th Regiment Nizam's Infantry.*

Area.

The Circar of Dowlutabad is an extensive district in the province of Aurungabad, averaging 60 miles in length and 50 miles in breadth. It is situated between the 19th and 21st degrees of northern latitude, on an extent of hill and plain bounded north by Kandesh, east by Beytelbarree and Jaulnah, south by Peytun, and west by the Ahmednuggur districts, the windings of the Godavery marking its limits upon the south-west. According to Arrowsmith's map, its area may be roughly estimated at about 2,900 square British miles, which, reckoning the population at 1,94,767 inclusive of that within the city of Aurungabad, gives 67 souls to the square mile.

Geological Structure.

The geological features of the whole district are simple and unvaried, forming as it does an integrant portion of the great trap formation of central India, the leading characteristics of which are all present.

The prevailing rocks throughout appear to be a clay stone porphyry or amygdaloid through which basalt is disposed either stratiformly in horizontal masses, or as instrusive veins and dykes; in all instances assuming a crystalline form which has conformed to the circumstances under which it had been ejected, and is either columnar, spheroidal, vesicular or amygdaloidal; these varieties are frequently observed passing into each other by such insensible gradations that it becomes almost impossible to assign distinct characters to the rocks so circumstanced.

A series of narrow ranges traverse the Circar in a direction almost east and west, their greatest height above the plains not exceeding seven hundred feet. All displaying in a marked manner, the peculiar streaked appearance noticed as so remarkable a feature in the Vindhya Range ; and, according as the rock that caps them happens to be composed of the hard or softer varieties of trap, so are their summits tabular or rounded.

The chain of hills upon the south have no particular name assigned them, but appear to be prolongations of the Sichel range; those upon the north are continuations of the Balla Ghat or southern boundary of the Berar valley; that portion within the Circar being known either as the Gowtala or Ajunta Ghats: this barrier presents steep and precipitous sides towards the low country of Kandesh, affording in a few instances difficult passage for wheeled carriages, through narrow rugged passes. The lofty peaks and projecting spurs along this range present several striking examples of the natural defences of a mountain fastness.

An enumeration of the principal rocky masses and minerals met within the district is here given.

1. Basalt occurring columnar in horizontal masses, the columns large, irregular and perpendicular to their planes ; texture close grained, of a dark greyish color internally, whilst the surface is of a reddish or a pale buff color. When the basalt occurs in dykes, the rock is disposed in prisms with vertical segments of small dimensions and very compact texture, generally showing purple stains in the fracture.

2. Basalt of a compact nature whose structure is globular, and on decomposing exposes a series of spherical coatings, small crystals of olivine are plentifully disseminated throughout.

3. Basalt of an earthy fracture, very close texture, dark color, tough, and unyielding under the hammer.

4. Phonolite another compact variety of basalt of a greyish color, fissile and ringing with a metallic sound when struck, cleaving readily into convenient forms, it is in request for building purposes.

5. Wacke or Indurated clay. This rock is met with in every degree of induration and forms the vehicle for the greater portion of imbedded minerals found in the district.

6. Amygdaloid Trap. The basis of this rock is wacke variously coloured from grey to buff having shades of light green and pink with every gradation of hardness : it is seen interposed between darker basaltic strata the association with which gives the streaked appearance to the bared sides of the mountains. Numerous silicious minerals are scattered throughout the rock of all forms and sizes; oftentimes irregular cavities of large dimensions are seen, whose sides are lined with calcareous spar, rose and rock crystals, and cachalong.

7. Red Amygdaloid Clay Stone. This rock is very frequent along the lower basis of the hills, its color varying from a pinkish hue to a bright brickdust red, and chocolate, it contains cavities occupied with shining zeolitic spar, or tabular and flattened chalcedonic minerals, coated with chlorite earth. It is not unusual to find the cavities empty and their sides covered with earth of a deep yellow or light green color.

8. Red Clay Stone Porphyry. A rock with sharp fracture and inclined to a fissile character. Its imbedded minerals are zeolite and silicious crystals generally in small rounded forms ; sometimes the contained minerals blend into the general mass, as specks or splashes, or by their infrequent occurrence confers the condition approaching to a simple rock. It is susceptible of a high polish and is admirably adapted for ornamental architectural purposes.

9. Ferruginous Clay Stone. This is the Ferruginous clay stone of Dr. Maculloch, and to be distinguished from the rock so termed by Dr. Buchanan, which is laterite. It is generally of a purplish grey color within, coated without with a brickdust or livid red ; usually seen under semi-columnar basalt, and reposing on globular trap rocks, varying in breadth from six or eight inches in two or three feet. Its structure is best observed in the beds of nullas, or passes in the hills where it may be seen taking a waving line as *if* adapting *itself* to the inequalities of the rock it reposes on ; where its surface is exposed (which is reddened) there are seen what at first sight has much the appearance of ripple marks being slight ridges or elevations arranged in semi-circular sweeps in an uniform manner, which project at their centre, as if produced by the force of some impulsive power, and terminate in a thin rounded margin, a series of circular elevations are sometimes seen as though a viscid mass, in flow-

ing tardily onwards, had met with some obstruction, and hardened in the act of receding from the obstacle. Very remarkable fistulous cavities are seen in this rock filled with zeolitic or calcareous spar, or having merely the sides coated with green earth. These tabular bodies are all observed to be disposed at right angles to the surface of the rock they are imbedded in.

10. Earthy Clay Stone. An ochreous bed of red earthy clay stone, if often seen lying under, and upon, the same description of rocks as the preceding variety, is associated with and is apparently the same rock modified by circumstances : its breadth is the same, but is generally found as a soft earth, occasionally passing into a rock resembling earthy jasper : when in its soft condition it separates into vertical masses with a conchoidal fracture, flying into numerous fragments from the slightest blow of the hammer.

11. Earthy Lime Stone. A rock abounding in the amygdaloid wacke strata, occupying veins and seams and particularly plentiful towards the lower portions of the hills.

12. Calcareous Tuff. Very extensive formations of this substance are met with occupying beds of various depths along the lower levels of the valleys, and near the base of the hills, often assuming the character of a semi-crystalline body.

13. Jasper. This mineral occurs in large beds amongst the amygdaloid wacke, assuming various shades of green, yellow, red, and black, the blending together of which in spots and veins; gives the rock a truly splendid appearance, its edges are translucent, with the exception of the black varieties. Heliotrope occurs also in great abundance.

The following minerals are those principally found in the amygdaloid beds.

EARTHY MINERALS.

Silica.—Rose Quartz,	Red and white Cornelian,
Milk Quartz,	Agate,
Rock Quartz,	Moss Agate,
Amethystine Quartz,	Onyx,
Semi Opal,	Jasper,
Chalcedony,	Henlandite,
Heliotrope,	Stilbite,
Cachalong,	Hornblende,
Hornstone,	Augite.

Magnesia.—Olivine.
Potash.—Felspar,
Chlorite.
Soda.—Mesotype.
Acidiferous Alkaline Mineral.—Nitrate of Potash.

Acidiferous Earthy Mineral.—Carbonate of Lime,
Calcareous Spar,
Opaque Green Calcareous Spar,
Calc Tuff.

A few general remarks will close this brief sketch of the chief rocks and minerals of the Circar.

The Basalt of the range is much mixed up with Olivine and Felspar, the presence of the latter causing the rock to disintegrate, and become a very unfit material for building, as may be witnessed in the crumbling walls and tombs around Aurungabad and Rauzah.

The purple Amygdaloid rock is the characteristic one of the lower levels, and in it are to be found the cave temples of Ellora and Aurungabad.

Basaltic dykes abound throughout the Amygdaloid trap, varying in thickness from a few inches, to twenty and upwards. Unlike the dykes of Great Britain and Ireland, they do not appear to have occasioned the slightest disturbance of the strata they have passed through: around Aurungabad several striking instances of these dykes are to be met with; at one place in particular on the road to Dowlutabad where the wall-like appearance, and prismatic structure of the rock is distinctly disclosed by having been cut through for the high road to pass. It is observed to leave the range at about two-thirds its way up, forms a sloping shoulder to the hill and descending on the plain passes away in a south-west direction, its course being distinctly marked by an upheaving of the plain. Other good examples of these instrusive rocks may be seen ridging the surface between Hursool, and the Delhi gate of Aurungabad.

Silicious dykes are of common occurrence in the wacken beds. Wherever they may have intruded, the rock on either side to the distance of some inches, has become indurated and altered in color; silicious minerals are abundant upon the plateaux of the hills. In the vicinity of Gowtala, Kunhur and Rauzah. Jaspideous clay stone variously colored and Heliotrope are met with in great profusion and beauty, as well as fine specimens of calcareous spar, and a peculiar variety of opaque calc spar of a pale green color is apparently so

tinged by chlorite: to these may be added the several varieties of quartz. The zeolitic minerals are principally fallen in with below the hills generally along the beds and banks of the larger nullas, where beautiful varieties of the foliated and radiated description abound.

Calcareous conglomerates overlaid by nodular basalt may be seen in the exposed banks of the Sewna river at Kunhur; the buried masses are rolled and water worn and similar in their nature to the present shingle of the river bed.

Natural Aspect.

The natural diversities in the aspect of the country are great, wide undulating plains occupying the south and west, offering a far tamer description of scenery than is observed towards the north and east, where the Circar is seen rising into an elevated region, crossed by a succession of narrow ranges, whose sides though bare and rugged, enclose valleys and dells of singular beauty and fertility. Their perennial streams produce a constant verdure, in pleasing contrast to the arid look the plains put on shortly after the ceasing of the rains, the mountain streams escaping to the low lands, are all seen trending their course towards the great bed of the Godavery in which direction the whole of the plains decline; a low stunted vegetation principally composed of Cassia, Acacia, Capparis, Mimosa, Prosopis, and Carissa, prevail upon the plains; whilst proceeding northward, well wooded districts appear with a jungle vegetation, often present among the ravines and gorges of the higher ghats.

Though a very considerable proportion of the surface be occupied by mountainous tracts and soil of a barren nature, still allowing for this deduction it contains much land of a very superior nature, manifested in the luxuriance of the growth of the cane and poppy and heavy corn crops raised throughout the Circar.

The cultivated soils are of two descriptions; that prevailing on the higher tracts is generally of a heavy rich aluminous character whilst on the plains it is principally a light and fertile loam; in either case of no great depth and resting upon a rocky substratum.

These two soils are derived from the wearing away of the surface rocks; the basalt going to form the stiff dark soil, whilst the amygdaloid wacken disentegrates into a friable earth; the lime and

sandy particles of which mingling with the stiff aluminous soil, counteracts its tendency to contract in the hot weather, as well as giving it higher powers of absorbing moisture; on the other hand, the wasting of the basaltic rocks mixing with light friable earth converts it into rich loamy lands, diminishing its radiating powers and causing it to be more retentive of moisture.

Such is the exuberant fertility of basaltic soils in general, that some are said to bear wheat cropping for thirty years in succession without a fallow, the secret rests in the knowledge that those inorganic substances plants require for their healthy condition, are lavishly afforded in the decomposition of these rocks, which year by year are spontaneously undergoing chemical changes by the alternate influence of heat, moisture, light, and air; and thus, unseen, are constantly restoring to the soil those inorganic substances the crop has been consuming. In the absence of these facts, it would be difficult otherwise to conceive how such fertility could exist in such a wretched looking soil, but here appearances are no criterion of its quality.

The number of beeghas contained in the whole Circar is estimated at 18,56,266, of which the Baghaet lands, or such as receive the benefits of irrigation, amount to 54,263 beeghas, 15 pds. The remaining cultivated portion, comes under the head zeroyet, and are stated at 4,80,543 beeghas, 17½ pds.; besides these 1,57,718 beegahs, 12 pds. are occupied in Enams, and 7,26,411 beeghas, 7¾ pds. lie fallow, the remaining portion being taken up by waste and barren lands, amounting in the aggregate to 4,37,328 beeghas, 19 pds.

The Koonbees call the dark soil kala muttee, and that remarkable white description only found in the neighbourhood of villages, pundree muttee; when calcareous matter is much mixed in the land it is termed choonkuda; if sand prevails, mulwut thamdee is the red soil formed by the breaking down of the ferruginous clay beds, and bulda when very stony, as is often the case along the foot of the hills.

Climate.

The climate of the Circar derives its peculiarities from a combination of circumstances principally referrable to its geographical position, prevailing winds, and the nature of its soil, and substratum, all of which have their share in modifying the climate.

The elevation above the sea is sufficiently great to effect the temperature, the highest points being about 1,800 feet, and the lowest 1,000 above the sea. The ghats that stretch along the western coast interpose their lofty barriers to the current of the monsoon, causing but a partial fall upon the countries east of them; the quantity of rain that falls within the Circar varies from 20 to 40 inches, the last year's rains, which were considered more than usually heavy, were found to have been 44 inches, the particulars of which were noted at Aurungabad, the distribution of which was as follows:

	Inches.		Inches.
January,	0· 00	July,	6· 78
February,	0· 00	August,	2· 39
March,	0· 00	September,	18· 31
April,	0· 12	October,	1· 00
May,	5· 69	November,	1· 86
June,	7· 85	December,	0· 00

We are not in possession of any observations of the rain guage that may have been taken on the higher parts of the district, but the fall must very far surpass that which is experienced on the lower levels, for floating clouds laden with moisture, are constantly seen passing over the flat country towards the higher ranges to the north, on which they discharge themselves.

As the sun passes into the southern tropic, the wind that generally prevails is from the north-east, lasting until its return again; bringing up the monsoon, during this period. The leading feature of the air is its excessive dryness, increasing as the season advances, from the extensive heated surfaces it has passed over.

The face of the Circar being crossed by numerous high ranges, electrical conditions of the air are induced which influence the currents of the atmosphere and produce at times sudden high winds.

The lowest range of temperature observed in the cold season was 46°, but it descends lower than this in localities favorable to the cooling effects of evaporation and radiation, as may be experienced in the vicinity of great masses of cultivation at night time. Late in the cold season it is by no means an uncommon circumstance, to note a diurnal range in the temperature of 40°, and upwards, from this cause, the face of the country being then covered with cultivation. The highest temperature was in May rising to 99° in the shade; upon the higher portions of the Circar the range is more confined,

seldom sinking so low, or rising so high as that now specified, but generally observing a more equable and moderate temperature. It has been supposed that frost is unknown in the Dukhun, but in the cold season of 1846, it caused great damage to the cane, poppy, tobacco, and wheat crops in many parts of the Circar.

Vegetable Productions.

In noticing the vegetable productions of the province it will be necessary to confine the investigation strictly to such plants whose peculiar qualities bear upon the necessities, conveniences, or gratifications of life, and for this purpose it will be convenient to consider them under the following arrangement:

1. Plants valuable for food; as esculent grains of all descriptions, garden vegetables, and fruits.

2. Plants used as food and fodder for domestic animals, and cattle.

3. Plants useful for medicinal purposes.

4. Plants employed as materials in the arts and manufactures.

5. Plants of an ornamental nature.

1st. *Plants valuable for Food.*

Esculent grains.—Gheeong, triticum sativum; bajree, holcus spicatus; jowarree, holcus saccharatus; chawul, oryza sativa; khundee, andropogon punctatus; mukkie, zea mays; rallah, panicum italicum.

Leguminous plants.—Ooreed, phascolus maximus; moong, phascolus trilobes; muth, phascolus aconitifolius; tour, cytisus cajan; mussoor, ervum hirsutum; kottee, dolichos biflorans; saim, dolichos; bun saim, dolichos lablab; mukhun saim, dolichos gladiata; (white var) runga mukhun saim, dolichos gladiata; (red var) mutke, dolichos fabœformis; batana, pisum sativum.

Esculent roots.—Aloo, solanum tuberosum; salep, orchis var- kuchaloo, helianthus tuberosus; moolee, raphanus sativus; ghor aloo, dioscorea alata; pend aloo, convolvulus batatus; soorum, arum campanulatum; gajur, daucus carota.

Alliaceous plants.—Peeyaz, allium cepa; lussun, allium sativum; kheera, cucumis sativus; karkaroo, cucurbita; pepo kuddoo, cucurbita lagenaria; kurilla, momordica charantia.

Vegetables bearing fruit.—Brinzal, solanum melongena; wall

wangee, solanum lycopersicum ; meerchee, capsicum fruitescens ; baindee, hibiscus esculentus ; singara, trapa bispinosa.

Pot Herbs, &c.—Chooka, rumex vesicarius ; myal ke bhajee, basella rubra ; umbaree ke bhajee, hibiscus cannabinus ; maytee, trigonella frenum grœcum ; ghol ke bhajee, portulaca oleracea ; soolfa ka bhajee, anethum graveolens ; souf, anethum fœniculum ; poodeena, mentha viridis ; kotmeer, coriandrum sativum ; udruk, zinziber officinalis ; huldie, curcuma zerumbet ; ajonan, ligusticum ajonan ; raie, sinapis chinensis ; pawn, piper betel ; bhang, cannabis sativa ; kala toolsee, ocymum basilicum. The unripe legumes of the hyperanthes moringa, varieties of bauhima, and prosopis spriegera, choolæ, amaranthus polygamus, besides many other varieties of amaranthus, as well as every palatable and wholesome leaf, which comes not amiss to the poorer natives as a bhajee in their food.

Fruits, stone fruit.—Amb, mangifera indica ; shuftaloo, amygdalus persica ; jamoon, calyptranthes jambolana ; bhair, zozyphus jejuba ; aula, phyllanthus emblica ; chironjee, buchanania latifolia.

Kernel Fruits.—Seeta-phul, amona squamosa ; jamb, psidium pyriferum ; anar, punica granatum ; kuranda, carissa carandas ; papaeea, carica papaya ; burooari, cordia myxa ; jootai karoonda, flacourtia sepiaria.

Pulpy Fruits.—Unjeer, ficus carica ; khela, musa sapientum ; chuppul saynd, cactus indicus.

Bacciferous Fruits.—Ungoor, vitis vinifera ; of which there are five varieties—hubshee, sybee, fukree, bokree, and bedaneh ; toot, morus indica ; kuhirj, fragaria ; tuparee, physalis perruviana ; boimvong, arachis hypogia ; phulsa, grewia asiatica.

The Orange Tribe.—Nurangee, citrus anrantia ; having three varieties, cintra or sungtra, kowla, and the bengalee ; a small species ; meetha neemboo, citrus limetta ; ambut neemboo, citrus var ; weer, citrus limona ; chukotar, citrus decumana.

Cucurbitaceous Fruits.—Kurbooz, cucumis melœ : of these there are the following varieties : jamb kurbooz ; ghilkee kurbooz ; burra masee kurbooz ; toomree kurbooz ; chuckrea kurbooz ; and cowha purree kurbooz ; turbooz, cucurbita citrulla.

Hard Shelled Fruits.—Kuthbel, feronia elephantum ; bel, ægle marmalos ; imlee, tamarindus indica ; rozelle, hibiscus subdariffa.

The above list of valuable vegetables and fruits are such as were

generally met with; the number could have been readily extended had the European gardens been explored, but the object being to give only such as were indigenous to the soil European vegetables have been purposely omitted, though all the varieties that are usually cultivated in India thrive most satisfactorily. The province has long enjoyed much celebrity for the delicious nature of its fruits, particularly its grapes, figs, and oranges. A favorable range of temperature together with a rich permeable top soil, a lower one not too retentive of moisture, and an abundant supply of water in flowing streams, or close upon the surface, all conduce to the strength and vigour of vegetation. To diminish the injurious effects of the high winds often prevailing, it is customary to surround the gardens with a high hedge composed principally of the milk bush and other trees of a compact foliage which oppose a screen to the force of the wind, and deprive it of much of its desiccating power. The variety of pot herbs, pungent aromatics, legumes and roots, with a few exceptions, receive little or no care in their culture, and may almost be considered as spontaneous productions.

2. *Plants used as food and fodder for domestic animals and cattle.*

There are several varieties of indigenous grasses that afford excellent fodder, the management of which is left entirely to nature; tracts of lands situated upon the hills near Dowlutabad are set apart as rumnahs for the use of the cantonment of Aurungabad; the better kinds of grasses of the hills are called by the natives the shaira poonea, marayel, koonda, and goondalee, but the most valuable of all is the hurriallee, which with the seepree, and kurreeyel, are common to the plains and rich vallies. In seasons of ordinary occurrence as much grass may be purchased for a rupee and a half as will provide fodder for a horse for a month, a bullock will eat about a rupee's worth, and a camel nearly twice that quantity, but in dry seasons cattle are hard pressed for fodder, and from the improvident habits of the ryot, no provision for such a calamity is ever made, so that their cattle perish in consequence. Possibly guinea grass if judiciously introduced, might be a valuable assistance, if its cultivation did not involve too great an expense. Lucerne is raised in gardens, but only in small quantities. The ryots generally feed their oxen upon the dry stalks of the

jowarree and bajree, the nourishing quality of the former in particular, keeping them in good working order ; to this is added green food afforded by green jowarree, bajree and mukkai, leaves and tender tops of the sugar cane, and waal a species of dolichos, &c. The trash from the sugar mills comes in as fodder to the oxen working at the mill, and the refuse of the kullees all goes to assist as food. Buffaloes find good pasturage upon the banks of the streams; the borrago indica which is common on heavy lands, is greedily eaten by them, and, it is said, causes them to give down their milk freely. Camels find good grazing amongst the valleys, in the leaves of the peepul, banyan, umlee, neem, baubul, &c., but their general food is dry grass through half the year. The tanks and nullahs provide a plentiful supply of sedgy succulent plants for elephants who are also assisted by the leaves of the peepul, banyan, cotton trees, erythrinas and adansonias: the low jungle of mimosa supply food in abundance, for browsing goats, as their pods and seeds in dry seasons afford nourishing food. The number of sheep bred and kept is but inconsiderable.

3. *Plants useful for medicinal purposes.*

Abrus Precatorius, Gooneh. A succedaneum for liquorice.

Acacia Arabica, Babool. Produces a valuable gum.

Acacia Catechu. Affords the astringent extract of catechu from the old wood.

Adansonia Digitata. Its virtues are unknown to the natives, but in Africa and Egypt it is much used for medicinal purposes. It abounds in mucilage; the leaves dried and powdered are said to be serviceable in fevers and diarrhœas. The pulp of the fruit is subacid, and the juice mixed with sugar, is valued as a specific in putrid fevers. The dried pulp is a remedy in Egypt for dysentery, and the leaves are eaten by the Africans, in order to restrain excessive perspiration.

Ægle Marmalos, Bel. The pulp is considered to be specific in chronic diarrhæa ; leaves, roots, and bark in decoction given in nervous complaints.

Andropogan Irasacusa, Rhowsah, Grass Oil. A fragrant rubefacient.

Arachis Hypogen, Boi-Moong, Earth Nut. A sweet oil is expressed from the nut, having the property of not turning rancid.

Areca Catechu, Foflee Sooparee, Betel Nut, Palm Nut. Narcotic and intoxicating: spurious catechu is prepared from it.

Argemone Mexicana, Feringhee Datura, American Thistle. Juice of the plant powerfully alterative and detersive, used in cutaneous and eye disorders.

Aristolochia Bracteata, Keera mar, Birthwort. A few drops of its intensely bitter juice, squeezed into wounds kills worms; hence its native name; dried leaves are anthelmintic; the fresh leaves are given for purging with gripes.

Asclepias Gigantea, Mudar, Gigantic Swallow-wort. This plant abounds in an acrid milky juice, which with the plant itself is employed in the treatment of all descriptions of nervous diseases by the natives. It has been also successfully used by the faculty in the cure of leprosy, lues, tenia, herpes, dropsy, rheumatism, hectic and intermittent fevers, given in doses of five grains of the powdered bark twice a day. The nausea or vomiting it may create, being removed by a purgative of castor oil. The active properties of this drug are found in the presence of a singular substance termed mudarine, having the property of coagulating by heat and becoming again liquid on exposure to cold.

Asclepias Acida, Sour Swallow-wort. Its milkly acid juice allays excessive thirst.

Asclepias Psendosarsa, Indian Sarsaparilla. Very generally employed in India by Surgeons as a substitute for sarsaparilla. Professor Lindley informs us that large quantities are now consumed in London as a fine kind of sarsaparilla, and is inclined to believe that the smilasperic acid of Mr. Garden is obtained from this species.

Bergera Konigu, Kari pak. Decoction of leaves given in dysentery: the bruised bark, root and leaves applied as stimulants.

Boswellia Glabra, Salai. Affords the gum olibanan.

Buchanania Latifolia. Kernels of the nut afford a bland oil.

Butea Frondosa, Palas. Seeds are said to be anthelmintic.

Cardiospermum Halicacabum, Balloon Vine. Root and leaves aperient.

Carica Papaya, Pupaea. The unripe fruit is eaten as a vermifuge.

Carthamus Tinctorius, Koosumba, Safflower. Seeds laxative; the oil applied to ulcers.

Cassia Auriculata, Turwar. The seeds reduced to powder, and blown into the eye, is a favorite remedy with the natives for country sore eye.

Cassia Fistula, Umultas. Pulp of the pod, and decoction of leaves laxative.

Cedrela Toona. Bark in decoction given in fever, and bowel complaints.

Celastrus Paniculata, Malkamnee. An empyreumatic oil is expressed from the seeds, of an acrid burning quality, and useful as a rubefacient. It has been employed successfully in beriberi.

Cissus Pedata, Gwaliya. Bruised root is applied to strains.

Cœsalpinia Bonducella, Kat Kuleja. Seeds tonic, leaves particularly useful as a poultice to hernia humoralis.

Cleome Viscosa, Dogs Mustard. Seeds hot : administered as an anthelmintic and carminative.

Clitoria Ternatea. Root is emetic; seeds anthelmintic and purgative.

Chlerodendron Phlomordes. Juice of the leaves alterative.

Cordia Myxa, Bhokur. The Sebesten tree. The mucilaginous berry when dried is the sebestena of the materia medica. Its properties are gently laxative and demulcent, and given in form of decoction in certain pulmonary complaints.

Croton Polyandra, Jumalgota. The seeds employed as a drastic purgative.

Cucumis Colocynthis, Indrayun. Powerfully drastic.

Curcuma Longa, Huldee. A favorite application of the native to recent bruises and wounds. In Java it is smeared over the body in the shape of an ointment, to guard against cutaneous diseases.

Convolvulus Turpelhuni. Root purgative.

Dalbergia Oojeinensis. Bark astringent, and used as a cattle medicine in bowel complaints.

Dalbergia Arborea, Kurrunjee. Juice of the fresh root is detergent. Oil, expressed from the seed, externally applied as a rubefacient.

Datura Fastuosa, }
Datura Alba. } Virulently poisonous and narcotic.

Euphorbia Ligularia, Munsa Shij. Root valuable, mixed with pepper, in snake remedies.

Euphorbia Tiraculli. Common milk hedge. The fresh juice employed as a vesicatory by the natives. A decoction of the root is carminative; the acrid juice, mixed with butter, is purgative.

Evolvulus Alsinoides. Decoction of the plant useful in bowel complaints.

Feronia Elephantum. Wood-apple. Gum is demulcent in bowel complaints : leaves stomachic and carminative.

Gentiana Verticillata. Tonic and stomachic. An extract is formed from this plant every way equal to that made from the officinal gentian.

Hedysarum Sennoides. Root tonic, and externally applied in rheumatism.

Herpestris Monniera. Juice used as an external application in rheumatism.

Hibiscus Populneus. Decoction of the bark alterative.

Hyperanthera Moringa. Horse raddish tree. The green root administered in fevers, and applied in a fresh state as a stimulant. An oil expressed from the seeds eases pains of the joints in rheumatism.

Jatropha Curcas, Erundee. Nut purgative : juice of the fresh plant detergent.

Justicia Ecboluim. Leaf and root tonic and antispasmodic.

Justicia Paniculata, Creyat. A very valuable bitter.

Linum Usitatissimum. Seeds discutient.

Melia Azederachta. An oil is expressed from the seeds, useful for expelling worms and cleansing foul ulcers ; it is also applied as a rubefacient in rheumatism. Decoction of the leaves a favorite discutient with natives.

Melia Azederach. Root bitter. Anthelmintic.

Mentha Sativa, Podeena. Infusion of mint, a favorite remedy in dyspepsia.

Mimosa Ferruginea. A wash for scorbutic gums is made from a decoction of the bark.

Mimusops Elengi. Water distilled from the flowers is considered useful in melancholia.

Mirabilus Jalapa. Root purgative.

Monetia Barleriordes. Juice of the leaf bitter and expectorant.

Morus Indica. Fruit gently laxative.

Nerium Odoratum. Bark repellant ; root taken internally poisonous.

Nerium Antidysentiricum. A valuable tonic ; the true conessi bark is afforded by this tree, but the difficulty in procuring the

genuine species has brought the drug into undeserved disrepute. The natives deem it a specific in dysentery and bowel complaints.

Nicotianum Tabacum, Tumbako, Tobacco.

Ocymum Sanctum. Expressed juice assists in the cure of ringworm.

Odina Wodier. Powdered bark mixed with oil is applied to indolent ulcers.

Pandanus Odoratissimus. The immature fruit is reputed emmenagogue.

Papaver Somniferum. The juice expressed from the seeds is considered useful in chronic diarrhæa, and their oil very bland and pure, fitting it for culinary purposes.

Phyllanthus Emblica, Myrobolan. Yields a nut of a harsh bitter taste, striking a black colour with solutions of iron, said to be gently purgative, astringent and corroborating.

Plumbago Zeylanica. Root in decoction is administered in fevers: the fresh bark bruised and applied to the skin vesicates.

Portulaca Quadrifida, Diuretic. The bruised leaves are applied in erysipelas.

Punica Granatum. Pulp cooling and aperient. The rind of the fruit is very astringent, and useful in diseases where this virtue is required. It is given to destroy worms.

Ricinus Communis. The castor oil of commerce is generally procured from the seeds of the smaller variety. A valuable purgative in cattle medicines is found in the root; a piece the size of a nutmeg mixed with chillies and tobacco leaves is a successful remedy in gripes.

Rumex Vesicarius. Useful as an antiscorbutic.

Saccharum Officinarum. The juice of the sugar cane is considered to be the best antidote to arsenic.

Sapindus Detergeus, Rhete, Soap Nut. Possesses singular and specific powers in chlorosis, the shell of the nut powdered, and snuffed up the nostrils is powerfully errhine—the natives employ it in cephalic affections; with water the nut forms a copious lather, similar to soap for which it is an excellent succedaneum.

Semecarpus Anacardium, Bilowa, Marking Nut. The acrid juice of the nut is given internally as an alterative and anthelmintic, and the expressed oil is useful as a vesicatory, but great caution should be

employed for a very distressing erythematic ædema sometimes supervenes upon its application. The fumes of the burning wood even have been known to produce this to a very severe degree; the face assuming a shapeless mass, from the diffused swelling occasioned. Some constitutions are so susceptible of its deleterious influence that even remaining under the shade of the tree causes œdematous swelling and eruptions. The native remedy in these cases, is merely to rub the swollen parts with the inner pulp of the cocoa nut bruised.

Sesamum Indicum. Leaves emollient, seeds contain a fixed oil, very sweet and pure.

Solanum Rubrum. The whole plant is supposed to possess powerful diuretic virtues.

Solanum Trilobatum. The plant is considered tonic and carminative. Flowers as well as roots, leaves, and stalks being used.

Sterculia Urens. Bark abounds in mucilage, which is in some respects like tragacanth.

Swietenia Febrifuga, Rohuna. Is a powerful tonic, and useful in the cure of intermittent fevers.

Tamarindus Indica. Pulp is slightly aperient; the kernels reduced to powder and formed into a paste, have the power of promoting suppuration in indolent tumours.

Terminalis Belerica, Beleric Myrobolan. Astringent.

Tribulus Terrestris. Leaves and root diuretic.

Vitex Trifoliata. Leaves repellant in rheumatism; seeds are said to have nervine, cephalic, and emmenagogue virtues.

Zingiber Officinale. Root employed as a valuable stomachic.

4. *Plants employed as materials in the Arts and Manufactures.*

Oil Plants.

Plants cultivated for oil are the carthamus tinctorius, kuldie, safflower. Sesamum orientale, tillee; racinus communis, castor oil; linum usitatissimum, linseed; kurleh, verbesina sativa. Those spontaneously produced are the kurrunj oil, expressed from the seeds of the dalbergia arborea; malkumnee oil, from the seeds of the celastrus paniculata; and grass oil, commonly termed rhowsah oil, from the andropogan irasacusa.

Gums.

A variety of gummiferous trees are found upon the hilly portions of the Circar, the principal of which are the acacia arabica; feronia elephantum; conocarpus latifo-

lia; feronia elephantum; boswellia glabra, neem; sterculia urens; butea frondosa; buchanania latifolia; bombax gossypinum, cedrela toona, &c., the whole of which are more or less adapted for economic purposes.

Dyeing Plants. Grislea tomentosa, rottlera tinctoria, morinda citrifolia, bixa orellana, nyetanthes tristis; butea frondosa, tamarindus indica; hibiscus populneus, dalbergea oojienensis, curcuma longa, terminalis belerica; phyllanthus emblica, punica granatum, &c.

Tanning. Several plants are found that possess high powers of preparing leather, by the amount of extractive matter they contain, in addition to their tanning, which makes the skins peculiarly soft and durable; of these there are one or two varieties of the acacia, the principal being the baubul; dalbergia oojienensis; conocarpus latifolia, terminalia alata, cassia auriculata, and phyllanthus emblica.

Charcoal. Acacia arabica, and other hard grained species of mimosa are used by the natives to burn into charcoal for common purposes, but that manufactured for gunpowder and fireworks is procured from the stems and roots of the asclepias gigantia and euphorbia tiraculli.

Cordage. The cannabis sativa, ganja; and hybiscus canabinus, ambaree, are cultivated for the sake of their fibrous stalks, being converted into hemp; the bark peeled from the roots of the butea frondosa constitutes the usual rural cordage.

5.—*Ornamental Plants.*

Trees possessing the greatest claims to an ornamental character are the following;—Two or three species of acacia, of which the ram kanta is an elegant instance; cordia myxa chlerodendron; melia calyptranthes; carissa; parkinsonia mimusops elengi, and mimusops hexandra, both of which the Mahomedans, with much taste, were in the habit of planting about their burial places, in company with the poinciana pulcherrinia and annona squamosa. Around Aurungabad are to be seen several magnificent specimens of the adansonia digitata, a legacy in all probability from the Abyssinian founder. Upon the undulating knolls between the valleys the most

striking in beauty are the grislea, pavetta, prosopis, flacourtia, banhima, clematis, combretum, celastrus, climbing solanum, butea, numerous kinds of asclepiaceæ and mimosa. The most conspicuous within the ravines are the sterculia urens, dalbergia oojienensis, begnonia, erythrina, santalum, grislea, boswellia; one or two varieties of bombacea, phyllanthus, nerium, gardenia, grewia, gmelina, conocarpus, bambusa, ficus, tectona grandis, and cedreela toona, the specimens of the latter have evidently been planted. The more lowly forest vegetation that claims a passing notice under this head, is the gloriosa superba, capparis, ajuga spermadictyon, evolvulus hirsuta, gentiana verticillata, justicia, lavandula burmi, plumbago, loranthus, nerium odorum, oxalis, and tamarisk. Before closing these remarks I would observe that the size of the trees increase as the country rises towards the north amongst the rich valleys of which, very noble specimens of the forest may be seen. As instances of which I may mention having measured at Nangapoor the stem of a butea frondosa, usually met with as a lowly growing shrub, here expanding into a girth of thirteen feet and a half, with proportionate height of upwards of sixty feet; the stems of the milk bushes measured three feet round. At Tajnapoor a melia azederachta was thirty-five feet round the but, and eighty feet high; and at Padree a venerable tamarind tree supposed by the villagers to be three hundred years old, is seventy-four feet high and thirty-six in circumference.

Mode of Cultivation.

Such is the remarkable social condition of the natives of India that it is by no means improbable the state of agriculture witnessed now-a-days, was pretty much the same as practised at very remote periods; a polity like theirs, which condemns the great body of the people to a hopeless state of degradation, confining their enjoyments of life to the very lowest minimum of all things needful and necessary, must tend as a matter of course to repress every desire for improvement, in the benefits of which they would not be allowed to participate. If to this cause be not attributed the low state that we find agriculture languishing under, it will be difficult to seek elsewhere for more sufficient reasons. The (Koonbees) cultivators are, generally speaking, an inoffensive, temperate, and all things considered, a hard working class; by no means deficient in intelligence, and well acquainted

with the leading principles of Indian agriculture. The knowledge of the past has served them for their guide, handed down from the remotest period by father to son. In their modes of culture we perceive their full acquaintance with the principle on which the succession of crops is founded, and from time out of mind have they been adopting drill husbandry practice, only commenced in Europe the middle of the last century. Reasoning upon these two facts alone, we cannot but accord to the Koonbee a far higher degree of excellence, than what, from their present unsatisfactory condition, we might feel at first disposed to allow, and which under any other state of society would have raised the art of agriculture to the same degree of importance it has assumed in other countries exempted from such evils as subject the cultivator to perpetual poverty.

Enclosures.

The mode of culture is as simple in its operations as it well can be, the particulars of which we will, now, consider. Beginning with the enclosures, we find a great deficiency in their protection, and rarely to be met with elsewhere than around sugar cane, or pan gardens, for the scanty supply of dry thorns stuck round growing crops, in the vicinity of public highways, hardly deserves the name. Hedges are more commonly met with on the higher parts of the Circar, than on the low lands; consisting generally of the euphorbia teraculli, carissa baubul, jatropha, flacourtia, cæsalpinia, and chlerodendron. The cultivation, for the most part lying unprotected, is at the mercy of stray cattle, and innumerable herds of deer; they attempt to scare the latter away by earthenware pots white-washed, and distributed about the fields on poles; or stakes are driven in the ground around the skirts of cultivation, to which loose twisted grass ropes are attached, these the deer instinctively avoid as snares.

Boundaries.

Boundaries are marked by slabs of rough stones, trees, or a broad stripe of land left unploughed. I am told it was an ancient custom in this part of the country, to place charcoal at the cardinal points under large stone pillars, or unhewn blocks; these were called "soor suma," and held in especial regard, the removal of which would be considered a heinous misdemeanour. Boundaries are often now the subject of angry disputes from their undefined limits. Every field originally had a name, in

accordance with these old boundaries; where the marks have disappeared new ones are given.

Farm Yard or Kullee.

The farm yard or kullee, is an enclosed space of ground outside the village. Here the grain is stored up, as brought in from the fields, and the usual allotments made. The grain is cleared from the husk, by driving cattle over it, though differing in one respect from this ancient mode of beating out the corn, by muzzling the cattle employed. Winnowing is managed by holding a basket of grain at arms length over the head, and allowing the wind to scatter the chaff as it is slowly poured upon the ground.

Kungee or Grain Stone Basket.

In storing grain for the current year's supply it is usual to place it in wicker baskets called a "kungee," about six feet in height, the bottom and sides of which are protected from insects by a coating of cows' dung, and a chuppur over the top to preserve it from the weather: it generally standing outside the house. These baskets hold from five to fifteen maunds. When the grain is to be stored up in any quantity for long periods, under-ground vaults are prepared called "pews," where it will remain in good preservation for several years; these receptacles vary in dimensions according to circumstances, holding from 120 to 225 maunds.

Pews or Grain Vaults.

The ground they are formed in is either the pandree muttee or soft morrhum. The first step in their construction is to sink a small shaft about the height of a man, and in which he can conveniently turn round: a circular opening is then dug in the bottom sufficiently large to admit a man to pass, and the ground excavated into a vaulted chamber. No further precautions are taken with the preservation of the grain, than to line the sides with stalks of kurbee, and close the orifice of the vault by a round flat stone, in shape similar to the common chukkee: the shaft is then filled up, and the surface smoothed down. It is a very remarkable circumstance that the intense heat the grain is subjected to in this confined state, does not deteriorate its quality, it being dug out uninjured after so long a lapse of time as even twenty years, the heat engendered is so great, as to prevent a man descending at once into the pew when first opened, and takes a day or two to cool before he can conveniently enter the place, to this circumstance is referred its not being infested with insects.

Implements. The rude appearance of the implements of husbandry are strictly in unison with its simple character, raising our opinion of the Koonbees by the ingenuity and patient perseverance they evince in their successful attempts to supply the place of more elaborate contrivance, which after all are not adapted for India, where the cost of labor comparatively speaking is so trifling: the great desideratum in this respect, being not to supply an expensive or complicated machinery, but simply to facilitate the operations of the field by improving such as are already found in use, what these implements are, we will now proceed to examine.

Plough. The plough or nangur is very primeval in appearance, possessing neither coulter nor mould board. The instrument is a crooked log of wood, cut from the baubul tree, bending nearly at right angles, and wedge-shaped. The point that turns up the soil, or share, has an iron shoe, or, in some instances, an iron bar fastened on the upper portion, projecting slightly over the forepart, and fastened at the back into the body of the plough: the whole kept secure by an iron hoop that slides over all, to the upright body the beam is attached that draws it, and the stilt or handle to guide its movements is fastened in a perpendicular manner at the back part. The breadth of the hinder part of the wedge shaped log performs very imperfectly the offices of a mould board. The yoke which is always clumsy and unnecessarily heavy, is attached to the beam by means of a long loop, rove through a moveable wooden collar, or block, that is placed beneath the beam; the loop passing over the yoke regulates the angle of the beam, by being pulled tightly or loosely, according to circumstances, a rope being fastened to the body of the plough for this purpose, which leads through a ring attached to the loop. In heavy lands four oxen are required to work, in the lighter ones but two. The share penetrates the soil to the depth of from nine to twelve inches. The whole machine costs about two Rupees. It is not improbable but the form of the Indian plough is far better adapted for the country in general than any now in use in Europe. It performs very effectually the object required, which is not so much to raise a new soil to the surface, possibly of a crude and injurious nature, as to expose the surface itself to the action of the air, which with

the assistance of the bukkur, or bullock hoe, it very thoroughly effects.

Bullock Hoe. The bullock hoe or bukkur is a most important instrument in Indian husbandry, and serviceable both for stirring the top soil and cutting up the weeds. It has a broad blade of iron fixed obliquely into a log of baubul wood about three feet long with a handle rising straight up. In stiff soils it requires two pair of bullocks to work it, cutting through the roots of weeds to the depth of three or four inches below the surface.

Double Bullock Hoe or Dowra Koolpue. There is another species of bullock hoe differing from the bukkur, by having two blades instead of one and of smaller dimensions. It is called the "dowra," and is an instrument well adapted for weeding drilled crops, and earthing up young plants.

Drill Plough or Charra Tiffan. The drill plough or "charra" has been in use from very early periods, and being particularly well adapted for the soil is generally employed; admitting of the dowra to destroy the weeds very readily as well as to loosen the earth between the rows. This implement consists of a bowl-like receptacle for receiving the seed into which the hollow bamboos are inserted for conveying the seed into the furrows, which are made by three small shares attached to the body of the instrument, behind which the opening of each several bamboos is placed. The value of such an instrument varies from 2 to 3 rupees.

Carts. The carts are very awkward and unwieldy machines, particularly those in use about hilly districts: axle-trees are made of wood, and the wheels of the hill carts are generally wooden discs, encircled by a rim of iron. The body is a solid piece of timber of the breadth of the cart and rests upon the axle-trees which are attached to it by two wooden pins. Upon this two long pieces of timber extend horizontally, situated in the centre, and not very far apart, supporting the frame-work of the machine which is square: two poles having their ends passed through the body and pinned, are lashed together, and form the beam to which the bullocks are attached. A cart is able to carry thirty maunds, and costs about forty rupees.

Kodalee or Pickaxe.

Two or three implements are employed for digging and rooting up old trees, these are the kodalee, and powrah. The kodalee is a small pickaxe, differing from the European one, in only having one pick; its value is about 12 annas.

Powrah or Digging Hoe.

The powrah or digging hoe is a blade of iron attached to a wooden handle, at a very considerable angle. Of these instruments there are two forms in general use; one in which the blade approaches a wedgelike form, the angle of union with the handle being very acute, in such a case the lever has its fulcrum thrown too close to the force applied, and much of its efficiency, as a digging instrument, rendered migratory; in the other form, which is the one most commonly met with, the blade is square, and placed on the handle at a smaller angle, throwing the fulcrum further from the hand towards the resistance. Their cost is about 12 annas.

Sickle or Durantee.

The sickle or durantee is employed for cutting grain and grass, they are of a semicircular shape; a line drawn from heel to point varies from seven to nine inches; average price 4 annas.

Koorpue, or Hand Weeding Hoe.

Weeding hand hoe, or koorpue, is a small implement, used for weeding; being a narrow iron blade, fixed in a wooden handle, the point of which is slightly falcated, and costs about 1 anna.

Manures.

The natural fertility of the soil of India, has occasioned a neglect of the important subject of manures. In these districts its chemical constitution exhibits a rich amount of inorganic salts; the various qualities of which are essentially requisite, in obedience to a fixed law of vegetable organism, for the perfect development of the several parts of the plant. It is in trap soils that we may look for a bountiful supply of aliment for the vegetable world, the amount varying with local circumstances, but even when so small as to afford but a single grain in each pound of soil a foot deep, it still is equal to ℔s. 500 in an acre. Flooding the country during the rains, spreads far and wide the soluble salts of the wasting rocks, hence

the remarkable fertility of certain trap soils, which are said to possess the power of raising wheat, the most exhausting crop that grows, for thirty years without a fallow recruiting its last energies by the restoration of these salts during the rains ; and in some countries, I believe in the Azores, the most luxuriant crops are raised, with no other manure than that afforded by pounded trap rocks, strewn over the land. These rocks, if examined into, will be found to produce abundant materials for a soil when reduced by the action of the air. For instance, in felspar we shall obtain potash, alumina, silica, and lime. In hornblende, magnesia and iron ; the zeolitic minerals are composed of silica, alumina, lime, soda and iron ; and in chalcedony, silica and alumina ; whilst in quartz we find silica in a pure state, and in jasper mixed with iron. Here there are materials for a soil highly favorable to vegetable life, which are brought into active operation by the rains, and unlike the evanescent character of soils enriched solely by vegetable matter, are permanent in effect. The usual practice is not to manure any crops but sugarcane, poppy, and pan ; the source from whence this is derived is the village mixen, and occasionally folding cattle. A very valuable manure for cane lands lies totally neglected in the heaps of cane ashes besides the sugar mill, and are not deemed sufficiently worth returning again upon the land, which, were it done, abounding as they do in silicates, could not but prove highly useful to the plant, which, it is well known, particularly needs these supplies. Green manures are occasionally applied to worn out soils. The green stalks and leaves of the tobacco plant are always ploughed into the land after the crop is pulled. Nothing can be more injurious and unfair towards the soil, than the pernicious custom of converting the excrement of the cow into fuel.

The cultivator divides the year into three seasons. The toossur, when green crops ripen in the rains ; the khureef, ripening in October ; and the rubhee, ripening in February, he commences his year with chytra shood in April, and at the dewallee considers the rainy months over and the dry season commenced. The Koonbee is well acquainted with the important fact that crops of opposite natures succeed each other with better success, than such as are of similar kinds, and has long put the principle in force. Oil plants as kuldee or karleh, are generally first sown, and then followed by wheat, jowarree or bajree. The Indian mode of mixing, cleaning, and

exhausting crops together is an excellent system. For instance jowarree is generally sown with moong and umbarree; bajree with kooltee, ralla, mut, moong, umbarree, and tour; and wheat with kuldee and mustard. Thus the several grains and pulses of different natural families do not interfere with each other's welfare, a fact attempted to be accounted for by modern cultivators, in the supposition that in mixed cultivation where plants are associated of various natural families, each particular kind derives dissimilar inorganic matter from the earth, for their own particular nutrition: that which is rejected by one sort being appropriated by another.

Staple Vegetable Products.

The principal staple vegetable productions are wheat, bajree, jowarree, chenna, sugar, tobacco, rice, tour, kuldee, and hemp.

Wheat. The land best adapted for wheat, is the rich loamy soil of the plains where it requires no irrigation, unless in great droughts. The varieties grown are the bunsee, poteah, and kuteah, the first named being the finest kind but needs irrigation, and is therefore less generally cultivated than the last which is raised in vast quantities, particularly in the districts of Phoolmurree, Gandapoor, and Untoor. Bunsee, which is a black bearded variety, is grown in some places on the higher lands, but gives place to sugar cane, which is there found a more remunerative crop.

The outturn of all dry crops in 1846 was very short and scanty, in consequence of the little rain that fell, and, what was worse, having been preceded by three remarkably dry seasons. The quantity of land under wheat cultivation in that year was 89,094 beegahs 15 punds, producing 32,008 pullas 30 seers, the net value of which at the average price of 7 rs. 1 a. 1 p. per pullah, gives 226,230 rs. 6 as. 9 p., a price double that of usual years. So light were the crops, that the return did not average beyond 43 seers per beegah, or something less than a bushel and a half; the bushel being calculated at 64 lb., this would give nearly three bushels to the acre. In the north of India, corn lands return from 16 to 44 bushels per acre;* the average return in England being 27 bushels.

* Vide letter from H. Bell, Esq., to the Agricultural Society of India

The fields intended for wheat are left quiet during the rains, then ploughed up once, and the bukkur passed and repassed twice to pulverize the soil for the reception of seed, which is put in with the drill plough in the proportion of ten seers of bunsee, or five seers of kuteah, to the beegha, ripening at the end of February: kuldee is sometimes sown broad cast amongst the crop, but more frequently drilled in at every sixth or seventh furrow. Numerous broad shallow watercourses are scattered about the field for the purpose of well flooding the land preparatory to sowing, as well as for watering the standing crop in times of drought. The crop is twice weeded and reaped by the sickle. It is allowed to stand too long after it has ripened, a practice which must injure its farinaceous qualities for many economical purposes, by converting its starchy properties to woody fibre, as for instance in the preparation of an article of diet called "saviya" a species of vermicelli where the bunsee variety is chosen, because it possesses a larger per centage of gluten. The way it is made is by soaking wheat in water, and then rubbing the husk off in a cloth; after this it is dried, ground, and finely sifted; what does not pass the sieve is called "soojee" or "rolling;" the fine flour sifted through is kneaded into dough with a small quantity of salt, in the proportions of a quarter of a seer, to five seers of flour: the whole is then well levigated with a wooden bat for three hours, when, having been sufficiently worked, it is rolled with the hands upon a board into thread like forms, occasionally moistening the palms with ghee, to facilitate the operation.

Bajree. Bajree is grown largely in Gundapoor, Phoolmurree, Byzapoor, Untoor, Walloej and Hursool, the amount in the Circar altogether being 1,97,923 beeg. 18 pds. producing 59,772 pul. 2 mds. 10 srs. which, at the average of 4 rs. 13 as. 1 p. per pullah, gives a net return of 2,87,996 rs. 9 as. 1 p. This crop does not require the best descriptions of soils, but frequently is found on them as a khureef crop, being occupied by cultivation of different kinds, in the rubbee season. It forms the principal article of food for the population and their cattle. The seed is sown generally during the middle of the rains, some times alone, or mixed, and is ready to be cut in five months. The Koonbees are busily employed in the hot season preparing their land intended for rain crops, and after the first falls work it with the buk-

kur backwards, forwards, and diagonally, collecting old stumps, roots, and stubble in heaps and burning on the land, to be mixed in with the soil by the bukkur, no manure is given, the crop is weeded once by the small bullock hoe. The amount of seed required for one beegah, is two seers.

Jowarree.

Jowarree is not to be extensively cultivated as bajree, it is principally found upon the low undulating plains of Wallooj, Gundapoor, and Byzapoor; there are two varieties cultivated, the smaller or red kind in June, and the larger or white kind in October.

The culture is similar to that adapted for bajree. The total amount of land thus occupied is 1,42,069 beegahs 18½ pds., returning 40,997 p. which is valued at 1,89,272 rs. 14 as. 8 p., taking the average price of a pullah at 4 rs. 9 as. 1 p.

Chenna.

This article is raised in large quantities in Gundapoor, Phoolmurree, and Untoor. The quantity of land thus employed in the Circar is 40,139 beegahs 15 pds. giving an outturn of 13,798 puls. 1 md. 3 srs. realizing 94,130 rs. 6 as. 3 p., at the average rate of 6 rs. 14 as. 3 p. per pullah.

Sugar Cane.

This cultivation is carried on in every Purgunnah of the Circar, but more particularly in those of Phoolmurree, Taklee, Untoor, and Sooltanpoor; upon the low plains between Byzapoor and Aurungabad, there is comparatively but little, save at Dowlutabad and Hursool; that grown in the Sooltanpoor and Phoolmurree Purgunahs, is considered to be of first rate quality, the land there contains lime and iron in a state of peroxide, and so situated as to command an ample supply of water for irrigation. Great care is bestowed upon the soil in preparing it for the crop which is only grown once on the same ground every two, three, or four years according to the quality of land. The field is commenced preparing in November by ploughing up the soil no less than nine times, and manuring plentifully. Early in February the planting begins, which is done by taking cuttings from the old plant near the top, each cutting being about a foot and a half in length, which will include two or three internodary joints, the field having been prepared by the plough, either into small plots or deep furrows about 18 inches asunder, is well flooded so as to form the trenches into soft

muddy beds, the labourer casts the cuttings singly down before him lengthways, as he walks along the trench, allowing a space of but two or three fingers breadth to intervene between each cutting, and as he progresses, he presses the cutting into the soft bed, with his foot: the field is now daily flooded until the shoots have risen about six inches above the soil, when water is restricted to every fourth or fifth day which must be continued until the rains set in and after they have ceased or the cane be ripe to cut, which takes place just immediately prior to its coming into flower, a period of about twelve months from its being first planted. The crop has to be weeded about four or five times, and in the rains when all vegetation gets rank two or three plants are bound together by their lower leaves for support to each other in high winds. There are two varieties of cane grown, the red and white sorts. The former is called "Domeah," the latter Kurree. The domeah is the kind generally seen; it requires more manure than the other variety, yields a richer and more abundant extract, and from its drier nature, is better adapted to stand the climate found upon the high lands. They are however both generally to be found growing together in the same plantation, on account of the red kind some times spoiling by excessive cold, in the early part of the year, which does not, in the same degree, affect the white variety.

Upon an average, a beegah of good sugar cane land yields from four to seven pullahs of rub, or pot extract. Further consideration of this subject will be deferred till we come to treat upon the manufactures of the Circar.

Tobacco. No very fine varieties are raised: it is more cultivated in Byzapoor and Phoolmurree than elsewhere, preferring a rich reddish brown soil in these localities; at other places it is seen on the outskirts of villages, providing the "Forica" for the inhabitants. The land is little dressed for this crop, the surface soil only being once moved by the bukkur, previously to the young plants being planted: it requires one weeding and, as it is coming into flower, the tops of the plant are nipped off, which causes the leaf to be of better quality; a species of cricket is apt to destroy the tender plants, and the growing crop is much injured by a pernicious parasite infesting its roots called the Orobanche Indica.

There are 2,122 beegahs 16 pds. under cultivation producing 561

pul. 1 md. 30 srs. and yielding a return of rs. 6,236-13-3 at the rate of 11 rs. 0 as. 9 p. per pullah.

The weed is prepared for market as follows: the matured leaves are plucked, and spread out in layers in long beds upon the ground, where they remain for ten or twelve days; after which they are turned over, and continue so exposed for another like period, when they receive, on the last day, a plentiful sprinkling of water, administered morning, noon, and evening; before the sun rises the following morning they are all gathered up and piled in heaps, having heavy weights placed above to flatten them down, and in this condition they are allowed to ferment for four and five days, when the weights are removed, and the heaps opened, the leaves are then freed of their stalks, and smoothed into bundles, weighing from two to four seers each. The class of people who follow this business are generally bearers.

Rice. This grain is very sparingly cultivated in all the districts, and, generally speaking, is of a coarse and large description, reckoned extremely indigestible by the natives; an exception however occurs to this in the kind grown at Durungabad, which is fine and small, and considered of a very superior description. This cultivation is mostly found in the largest quantities at Untoor, Saitoonda, Phoolmurree and Koottabad. It is planted out in beds during the rains, which are flooded every eight or ten days; the land having previously been prepared by ploughing and manuring, fifteen cart loads of manure being given to every beegah. It requires weeding three times, whilst the crop is growing, and is ripe in six months. It requires ten or eleven seers to sow a beegah.

Rice lands occupy 4,149 beeg. 9 pds. and return a produce of 2,160 pul. 1 md. 5 srs., yielding 10,044 rs. 6 as. 4 p. at the average rate, 4 rs. 10 as. 4½ p. per pullah.

Tour. This grain is generally sown as a mixed crop, though not invariably so: on this account there will arise some difficulty in assigning to this and all mixed crops, the correct amount of land occupied. It is necessary to mention this circumstance as the district officers forward to me their statements of the produce, as though they were unmixed crops, and are therefore given by me according to their calculation. In Walloog and Gandapoor this very useful pulse is raised in rather large quantities, the soil being there well adapted for its culture, being light and rich.

There are 19,113 beeg. 13 pds. of this cultivation, producing 5,009 pul. 1 md. 10 srs. and yielding 23,672 rs. 12 as. 3 p., rating the average price of one pullah at 4 rs. 11 as. 7 p.

Kuldee, Carthamus Tinctorius. Much of this is grown, and very frequently as a mixed crop, it succeeds well in the rich soils of Phoolmurree, Untoor, and Gundapoor, where it is extensively cultivated.

There are 18,648 beeg. 14⅓ pds. occupied with this plant, the produce of which is 6,602 pul. 0 mds. 24 seers, whose value is 22,294 rs. at the average rate of 3 rs. 6 as. 0 p. per pullah.

Hemp. Little of this is grown as an article of export, excepting at Phoolmurree; in many places only cultivating sufficient for the wants of the district. There are 3,457 beeg. under cultivation, producing 1,045 puls. 2 mds. 20 srs., the value of which is 7,045 rs. 7 as. 5 p. at the rate of 6 rs. 11 as. 8½ p. per pullah.

The above are the principal staple productions. In closing this part of the inquiry, I will briefly notice one or two articles which are not of sufficient note to be thus rated.

Opium. There are 936 beeg. 12¼ pds. employed for raising this article the produce of which is 11 puls. 2 mds. 1¾ srs. yielding 8,621 rs. 2 as. 11 p. as its value, rating the seer at 6-2-3½. It is grown in the largest quantity at Untoor, and Phoolmurree.

The poppy requires the richest sort of land, and constant irrigation. It is planted towards the close of the rains, and comes to perfection in four or five months, during which period it receives the unceasing attention of the ryot. The sites for its production will generally be found in the valleys where running streams abound, as well as richer and deeper soils. The same system of preparing the land is adapted as that observed for sugar cane. The land is either divided into furrows, or small plots, and sown and watered once in four days for the first fortnight: from that time till it flowers, which it does in another six weeks, it is watered but once a week, and, after flowering, only once in eight days. After the plants have sprung up, they are thinned out, leaving a hand's breadth between each, and are well weeded once a month. In about three or four month's time, the capsule will have reached the most favorable period of yielding its

juice, and on the falling off of its petals the operation of wounding them is commenced, which is effected by a three-pronged sharp pointed instrument, whose points cannot pass beyond a certain depth, and just sufficient to penetrate its outer covering : the incisions are made longitudinally, and in the heat of the day : during the night the juice exudes which is removed on the following morning with a blunt iron scraper, and put into a small shallow brass saucer : the scraper as well as the thumb and finger are occasionally rubbed with linseed oil to prevent the gummy juice from adhering. Each day's gathering is thrown into a common receptacle, where it is well saturated with linseed oil, to prevent its evaporation, as well, no doubt, as to add to its weight hereafter.

The seeds are sold as an article of food, but are not made available for oil in this part of the country, though they yield as much as one-third of their weight. They fetch one rupee for 11 seers.

The cultivation of opium is said to have greatly decreased during the last five or six years, owing to disagreements between the farmers and the subordinate agents of the Revenue Collectors, so that its culture now barely remunerates the grower, in place of producing one of his most profitable returns.

Cotton.

Only grown in small quantities at Saitoonda Havalee, Hurşool, and Untoor ; the whole amount being 527 beeg. 13 pds. producing 213 puls. 0 mds., 20 srs. at the rate of 6 rs. 0 as. 5 p. per pullah, yielding 1,284 rs.

Turmeric.

This is raised no where but at Poolmurree and Saitoonda, and in no large quantities. There are 49 beeg. 12 pds. thus occupied producing 30 puls. 2 mds., giving a return of 413 rs. at the rate of 13 rs. 8 as. 0 p. per pullah.

Fruit.

The returns under this head exhibit 324 beeg. 1 pd. as so employed, yielding 269 puls. of fruit, and realizing in the aggregate 2,502 rs. 1 a. This comprehends grapes, oranges, figs, and mangoes.

The vineyards are principally found in the vicinity of Aurungabad, Kunhur, Rouzah, Sooltanpoor, and Padlee. The vine, like the orange tree, evidences a moiety of those incidental blessings that always accompany, and tend to mitigate the evils of war, in the early history of a people ; for conquering nations have ever been the means by

which vegetable productions have been widely and rapidly disseminated over the globe. The grape, originally confined to Syria, has now a very extended range, but it requires certain physical peculiarities of soil and climate, to ensure the due perfection of its fruit, which under favorable circumstances, are obtained in these light basaltic soils. Cow-dung is the manure employed, which is found to be sufficiently azotised for the purpose, and applied in March, when finished bearing. The vines are then pruned, and the soil opened up by the bullock hoe: a second crop of an indifferent description, comes on during the rains, which is called the sour crop "Khutta bhar," and is only used for making vinegar: after this, the vines are again pruned and slips set to strike. Weeds are kept down by occasionally using the bullock hoe, which also exposes the soil to the action of the air. The vines are planted six feet equidistant from each other, and trailed over props of the pangara (Erythrina Indica) which are kept pollarded for the purpose, water is given once in eight days, a plantation is supposed to reach its prime in five years, and will continue bearing for thirty. The produce is sold generally by the crop, to dealers for exportation to Bombay, Poonah, Nuggur, Malligaon and Jaulnah. The better varieties as the hubshee and sybee fetch one Chandore rupee per three seers. The fuckree sell at 21 seers for the rupee and the bokree cheaper still.

Melons.

Musk and water melons are grown during the hot months in the sandy beds of the river, the plants are put down at the end of February, and will be ripe in April and May. The manure found best adapted is night soil, but where that cannot be procured cow-dung in a liquid state is used.

Prices of principal Products.

The prices of produce fluctuate with seasons, more observable in dry grain than with any other commodity. Living from hand to mouth, the ryot is very seriously affected by every unusual rise or fall in the value of produce. A season of overabundance glutting the markets, is to him equally as unfavorable as one of scarcity, for he cannot wait for the markets to improve, but is compelled to sell under his accustomed profits in order to make good the payments of his kists, now falling due at harvest time. The overstocked markets are taken advantage of by grain merchants to fill up their under-ground vaults or "pews" as

they are called. During the preceding four years, little rain had fallen, producing in each succeeding year, a gradual rise in the price of every article of produce : dry grains, as usual, advancing beyond all others, doubling and trebling their original rates in that period. In the Appendix will be found a detailed statement of the range of prices of the principal products throughout the Circar for the last seven years, inclusive of the present one.

Tenure and Occupation.

In elucidating the complicated question comprehended under the head of tenures, so much matter of a conflicting and perplexing nature presents itself, that rather than hazard crude notions involving doubt and uncertainty, it has been deemed prudent to defer all remarks upon the subject, till more extended observations may have tested the value of the information obtained, and placed me in a position to give the results of my inquiries with that degree of confidence the accurate nature of the duty requires.

With respect to the cultivators, they are divided into two classes, the Meerasdars or Wuttundars, and Ooprees.

The Meerasdar holds lands in fee enjoying the usufruct of the soil, conditionally, that he renders to Government a stated amount of the produce of his labors, rated and fixed in conformity to the extent, and qualities of the soil.

The Ooprее is merely a tenant at will, occupying lands not his own, temporarily from year to year upon agreement.

Enams, gifts of land to charitable and religious purposes : and Jagheers, the gifts to military and civil officers of the state, have their revenues permanently alienated. The system observed in the management of these lands, is the same as that followed in the Circars, with this exception, that measures are seldom pushed to such extremities by Enamdars or Jagheerdars, from their possessing a permanent interest in the welfare of the people and improvement of the soil : the policy of such forbearance is visible in the superior condition of the land, cattle, and implements as well as the meliorated state of the ryots themselves.

Modes and Rates of Assessment.

The rates of assessment at the present day have become mere arbitrary arrangements, giving rise to a very irregular and unsatisfactory system, in which one party by endeavoring to exact all he can, and the other resorting to every expe-

dient, to pay as little as possible, produces endless confusion and embarrassment to all concerned. Though the rule of guidance in the adjustment of Sevies is professedly that which has obtained in former years, yet it is often departed from ; for should the amount of revenue fall short of the required sum, or the season prove particularly abundant, a Jastee Puttee is levied, whilst on the other hand, it must be mentioned, that Government often remit the dues in time of public calamity. Should it so happen that the ryots refuse to comply with the increased demands made upon them, and coercion be resorted to, they immediately desert their fields and villages ; an extremity which quickly brings about an understanding between both parties.

The total revenue upon a village is rated at three seasons according to the nature of the crops, viz., the *toossar*, *khurreef*, and *rubbee*, and a portion is taken at each harvest. At the toossar, which is generally a small harvest, a small kist is taken ; if the khureef forms a larger portion of the whole produce, the amount levied is proportionately large, and is taken in two kists, the first when the grain is ripe (and the payment of a kist is required, before permission is given to reap the grain) ; the second kist is taken before the kullees are allowed to be opened : the remaining portion of the revenue is payable upon the rubbee crop, and is also taken in two kists which are paid in like manner before the crops are reaped, and the kullees opened ; and should the rubbee harvest be of a more valuable nature than the khureef, the kists taken at this period are the largest.

An arrangement having been entered into between the Mamlutdar and the Patels for the settlement of the year's revenue, seebundies are sent by the former to the latter, to aid them in collecting the dues from the ryots at the several harvests ; and should any ryots refuse to furnish his quota, he is put under custody of a seebundee, to whom he is obliged to furnish daily batta, until he pays the demand made upon him : if this proves unsuccessful, harsher measures are adopted, amounting to personal violence and confinement, and eventually to the sale of all he is possessed of, should he still persist in his contumacy. When the crops run a risk of spoiling by too long standing, pending difficulties in the way of realizing the demands of revenue, the Government reap the fields, and appropriating its own share give over the remainder to the owners.

Labor employed, and Remuneration.

Where the families of the ryots prove insufficient for preparing the fields and gathering in the harvest, laborers are engaged, who are paid either by wages of money, grain, or, in some instances, merely providing subsistence and clothing. The daily pay to a man for ordinary work is from three dubboo pice to three pice and a half; to a woman, two pice, and to a boy or girl, one pice and a half; working from sunrise to sunset, and resting at noon. Those laborers employed at the sugar mills, receive their hire partly in money, and in the produce of their labor; those who drive the bullocks and supply canes to the rollers receive one pice daily, and three quarters of a seer of goor, whilst the person who brings the fuel has nothing beyond his maintenance and clothing.

Rivers.

The principal rivers of the Circar have their origin amongst the range of hills, and are named the Poornah, Sewna, Geerja, Ajnah, and Gunda, whilst the Godavery flows along the south-west boundary.

These rivers run in different directions: the Sewna and Gunda in a southerly course to fall into the Godavery, and the Geerja, with its innumerable streams, into the Poornah, that passes away in an easterly direction: the beds of all are, for the most part, rocky and shallow, and some contain water the whole year round; in the rains these streams become occasionally rapid torrents, laden with fine alluvial matter, washed from the under lying rocks they rise from, and affect the agricultural capabilities of the soil, in the manner before alluded to.

The Godavery flows along the south-west edge of the Circar for fifty miles in a very tortuous manner, in consequence of the flatness of the country; its many feeders from the hills, cause a rapid rush of waters to take place in the monsoon, when its alluvial depositions are sometimes so great as to threaten new channels being formed for the bed of the river, a circumstance that actually occurred about twenty years ago at the debouchement of the large stream that flows from Byzapoor into the river bed. The banks are sometimes seen to be very precipitous and deeply cut by water courses; the bed rocky, but sometimes covered to a great extent with sand, and varying in breadth from two to three hundred yards. At Toka the Bombay road crosses, and as an impetuous stream always sweeps

by during the rains, the Bombay Government have provided a broad and convenient ferry boat for the use of the public.

The two rivers emptying into the Godavery, are the Sewna, and Gunda.

The Sewna has its source below the Paidkah hill fort and proceeds first easterly to Khunnur, where it takes a turn to the southward, passing through an extensive tract of country, depositing large beds of rich soil in its course to the Godavery, which it falls into below Sownkhair.

Generally speaking its banks are low, though occasionally seen rising to a height of forty or fifty feet and precipitous. Shortly after the rains, the stream becomes very shallow, and sometimes is lost amidst the immense quantities of alluvial matter obstructing the bed.

The Gunda river rises below the hills close to Russoolpoorah and Mousalla, passes easterly for some distance, when joining with a large stream from Hursool, unites to form a broad shallow sandy bed, and proceeding past the city of Aurungabad, unites itself after a very winding course, with the Sewna in the Pytun Purgunnah.

The important Poornah river has its sources amongst the higher ranges to the north of the Circar, near the base of the Gowtala ghat, a mile and a half west of the small village called Mahone, in the Untoor Purgunnah in longitude 75° 14′ 51″ east, and latitude 20° 23′ 50″ north. Its banks generally rise from twenty to thirty feet above the bed of the stream, which here averages at the broadest parts, about 150 yards from bank to bank; the bed generally rocky, and retaining water in jheels the whole year round. The course it flows is easterly, through a valley upon which it exercises the most important influence, visible in the luxuriant freshness of its vegetation.

The next river is the Ajnah that rises near the village of Tuphone, in the Untoor Purgunnah; takes a south-easterly course for several miles, and unites with the Poornah, south-east of Sissar Khair. Like the Poornah, this stream spreads beauty and abundance, over the valley it meanders through.

Passing southward, we arrive at the Geerja, which is a river of some importance; rising in the Byeemuhul hills, and running easterly, receiving in its whole course, streams, from the ranges extending north and south of it, and with their united waters join the Poor-

nah in the Jaulnah Purgunnah. Its banks are rugged, and the river bed very rocky, retaining water the whole year round.

The whole country is covered with dilapidated tanks. Bunds or bundaras, aquaducts, baolees, and draw-wells.

Tanks.

Upon the plateau above the fort of Dowlutabad, are to be seen a series of tanks, in the construction of which infinite labor must have been employed. In the vicinity of what is supposed to have been the site of the ancient city of Boodra Vuntee, or Bhoodda Vuttee, these noble works are principally to be found; and are no doubt the undertaking of the inhabitants of this once mighty city, though now assigned to the Toghlak kings; the probability being, that the latter only repaired, or enlarged what they found existing. The Toghlak kings, who performed these meritorious acts, were Sultan Ghias, his son Sultan Mahomed, and Sultan Feroze, the nephew of the latter; the memories of whom are to this day venerated by the Koonbees as the Toghlak Padshahs, protectors of the cultivators.

The tanks ascribed to Sultan Mahomed are the following. The Kootloogh Talow, a fine sheet of water when full, and faced with masonry and steps, having a summer palace, upon its banks, it is situated to the east of the village of Monsalah, and is called after the Sultan's tutor, Kootloogh Khan, who was Governor of the fort of Dowlutabad at the time.

The Purree ka Talao or as it is variously termed Rajah Yunas ka Talao, and Gungeerow ka Talao, the latter name being given to it on account of the Peer Gungeerow's tomb standing on its banks, is one of the tanks that were probably repaired, and not built by the Toghlak Sultan; it is of large dimensions, faced with stone steps on three sides, with an average depth of 70 feet and nearly 2000 yards in circumference, the bund which confines the water is 210 feet in breadth at top, and is thrown across a deep ravine; a broad flight of forty steps leads to the water on the north side, with a smaller one upon the south; it is fed by subordinate tanks, that have been formed towards the hills for this purpose: one of which is made also to supply the town of Rouzah by a line of under-ground pipes, leading from it. Tanks formed without cement as this is, are termed Ahmar Punty tanks, from the circumstance of the Pundit Ahmar causing many of this description to be made.

Besides these two, Sultan Mahomed Toghlak made the Doodeah ka Talao, a small tank at the foot of the Lambgaon ghat; a stone faced tank at the north-west entrance to Rouzah, and five others in its vicinity, all of which appear to have been formed for the convenience and necessities of the colony he had twice planted on these heights, when removing the whole population, as he did from Delhi, on two several occasions.

Near Elloora, a fine tank has of late years been repaired by Government, and affords the means of irrigation to a very fertile tract of land. Outside the northern gate of this town, stands the beautiful stone koond constructed by the amiable Alac Bae, the mother of the Holkar of the day and grandmother to the present one. The spring that here rises, is supposed to possess miraculous properties, and to have cured the Rajah Eloo of his leprosy; in gratitude for which, he is said to have excavated the remarkable temple of Kailas, in the neighbouring hills. This most excellent Princess, whose life was devoted to acts of philanthropy and piety, has built many wells and baolees in this part of the country, for the use of the wayfarer.

In the valley watered by the river Geerja, in many places are to be seen the magnificent remains of former aqueducts and bundaras; more especially about the neighbourhood of Sooltanpoor. Tradition assigns these works to Sultan Gheias ood deen Toghlak. Judging from their present ruinous condition this system of irrigation must have been very long abandoned.

Irrigation.

Irrigation may be regarded in the light of an elegant mode of supplying manure, the fertility of soils mainly depending upon the quality and quantity of water, employed for this purpose, impregnated as it is with mineral and vegetable matter. In these districts the attention of the earlier Mahomedan conquerors had been directed specially to the effectual, and ample supply of this essential element; the traces of these useful works are still visible, scattered about the country, indicating the munificent spirit that formerly prevailed, nor are such undertakings to be lightly considered in countries like this, subjected to uncertain monsoons, and possessing but a shallow soil. Artificial irrigation converts the ordinary lands producing but single crops of common grain, into those giving three, and of the richest description. The mode by which the mountain streams were made available for purposes of irrigation, was

to build a bund of solid masonry across the bed of some nullah favorable for the purpose, of which there is no want of selection, and to diffuse the pent up waters over the surrounding fields, by the means of channels constructed for the purpose. The bund built across the nullah is called a "Bundara," and the channels "Phats," it is necessary to form smaller bunds in these channels, to divert the water on the various lands, and they are termed a "Barra." These works are undertaken at the joint expense of the cultivators, who in their turns enjoy the benefit: the whole management is under the charge and control of a Seebundee.

The plan followed for raising water from draw-wells, is the usual one by mhote and bullocks; two wheels may often be seen working at one well.

It is not usual for the Circar to build wells, those existing have been formed by private individuals, an encouragement to undertake which is sometimes offered by holding out the privilege of "Meeras" to all such as do; or allowing lands which it waters, to be continued assessed as jeraet for a specified term.

The expense of erecting a well of the better description, lined with bricks, and supplied with stone copings, will cost on an average about rupees two hundred and fifty, those of an inferior kind from one hundred, to a hundred and fifty rupees.

The repairs of a well are undertaken by the cultivator, but should he be too poor to raise the necessary funds, Tuccavees are granted by the Circar; beyond this, no other assistance is afforded the Koonbees by Government for irrigation. The village tank and wells, are kept in repair by the community at large.

Cities, Towns, and Villages.

The Circar is divided into Purgunnahs, each composed of a certain number of towns and villages, called Turrufs. The division comprehended under the head Talookah is only known in the Purgunnah of Untoor.

Shehr, is the term applied to the city; *Kusbah*, to the market town; *Thanna*, to the town where the Tahseeldar resides; *Mouza* or *Gaon*, to the village; *Barree* or *Warree*, to the hamlet; and *Poora*, to the suburbs.

Havalee, is the term given to the household lands of Government, and were generally districts in the vicinity of large towns, and an-

nexed thereto originally for the supply of the military and civil establishment of the Mahomedan Government.

All the towns and villages are surrounded by walls of stone or mud, many of which are much out of order, but if repaired, are sufficiently strong to protect the inhabitants from common marauders. The walls are usually flanked by towers, and not unfrequently further protected by cavalier bastions. In the centre of the village a square building, generally of brick, is seen, with its walls pierced for musquetry, and having but one entrance, this is the Patell's house, and forms a sort of citadel to the village in cases of emergency.

The form of the houses vary throughout the Circar, according to circumstances: those on the lower plains, being more inclined to adopt flat terraced roofs, which are made of mud amongst the poorer classes, and chunam in the houses of the rich; whilst on the higher lands, pent roofs prevail; the better kinds being tiled. On the whole the inhabitants appear comfortably lodged.

My limits do not allow of very detailed descriptions of towns and villages, I will therefore confine my observations chiefly to the notice of the principal ones of each Purgunnah, whose population exceeds 500 souls, merely offering remarks in a fuller manner upon a few, whose importance require it. Proceeding therefore to the notice of this question, I shall commence with Aurungabad, but having fully treated already of this city, little beyond a passing notice will now be required.

Aurungabad is the residence of the Soubah, and a station of the Nizam's contingent. Its population about thirty years ago were computed at 100,000;* according to my calculations made from a very careful enumeration of houses, I estimated the whole in round numbers at 40,000: 4,199 pucka houses, varying in size from four stories to one, and 2,932 kutcha houses. In computing, five persons were allowed to every single storied house, and four to every story exceeding this, which in the aggregate gave $5\frac{1}{2}$ souls to a house; with this serious falling off in the population, there will be found of course, a similar declension in the prosperity of the city, for in lieu of there being a thousand looms at work, as was then the case, manufacturing costly brocades and silks, the annual worth of which was estimated at about three lacs, there are now but sixteen for brocades,

* Sir Henry Russell's report on the Nizam's Dominions.

and forty for silks, the united value of which does not exceed 80,000 rs. The havalee villages attached to the city amount to 39, with a population of males 1,235, females 1,029.

Hursool. A dilapidated kusba town, situated two miles N. E. of Aurungabad. It has bunniah shops 1, pucka houses 3, kutcha houses 105, and a population of males 304, females 275. In the flourishing periods of Aurungabad this town was largely populated : its magnificent surais, crumbling mausoleums, ruined garden houses, and rouzuhs, afford sufficient evidence of its former prosperous condition. Its principal towns are Chikultana ; bunniah shops 6, pucka houses 12, kutcha houses 216, males 1,076, females 515. Chowka and Nourbarree ; bunniah shops 5, pucka houses 5, kutcha houses 204, males 456, females 398 ; and Burrood, kutcha houses 139, males 385, females 380.

Sittara. A small kusbah distant 3 miles south of Aurungabad ; bunniah shops 6, pucka houses 51, kutcha houses 21, males 309, females 288.

Wallooj. A kusbah of some importance 8 miles south-west from Aurungabad ; bunniah shops 16, pucka houses 11, kutcha houses 147, males 583, females 538. Its principal towns are Ranjungaon khurree ; bunniah shops 9, pucka houses 3, kutcha houses 118, males 356, females 232. Toorkabad, formerly the kusbah of a purgunnah but now united with Wallooj ; bunniah shops 18, pucka houses 8, kutcha houses 90, males 410, females 261.

Gundapoor. A considerable sized kusbah. It is situated 28 miles south-west of Aurungabad, containing bunniah shops 20, pucka houses 82, kutcha houses 355, males 1,221, females 1,129. Its principal towns are Lassoor, pleasantly situated on the banks of the Sewna river ; bunniah shops 43, pucka houses 78, kutcha houses 189, males 731, females 740.

Amanoollabad. Bunniah shops 3, pucka houses 93, kutcha houses 36, males 357, females 359. Kaigaon ; bunniah shops 8, pucka houses 3, kutcha houses 105, males 508, females 394. Sewur kusbah with nine barrees attached ; bunniah shops 28, pucka houses 17, kutcha houses 419, males 1,205, females 1,100.

Garra Peepulgaon. Bunniah shops 20, kutcha houses 117, males 298, females 242. Bhervahanora ; bunniah shop 1, kutcha houses 86, males 255, females 248.

Byzapoor. This kusbah is situated upon the borders bearing 40 miles west of Aurungabad, a very considerable trade is carried on in the fabrication of silk goods, employing 125 looms, and 10 winding machines, besides 50 looms for cotton cloths with silk borders, for sarees; the estimated worth of which is from forty to fifty thousand rupees: the goods are principally disposed of at the great Mhyjee fair. Bunniah shops 141, pucka houses 575, kutcha houses 403, males 3,338, females 2,061. The principal towns are Boresur; bunniah shops 14, pucka houses 2, kutcha houses 115, males 437, females 383. Nawurgaon; bunniah shops 8, pucka houses 10, kutcha houses 103, males 341, females 244. Mahkalivargaon; bunniah shops 4, pucka houses 5, kutcha houses 66, males 250, females 255.

Khundalla. A kusba town situated 38 miles from Aurungabad in a north-west direction; bunniah shops 17, pucka houses 5, kutcha houses 196, males 444, females 390.

Khanapoor. A kusba town distant 24 miles north-west from Aurungabad; bunniah shops 6, pucka houses 12, kutcha houses 159, males 440, females 398.

Elloora. A large kusba two-thirds dilapidated. It lies 16 miles north-west of Aurungabad; bunniah shops 9, pucka houses 93, kutcha houses 88, males 605, females 623. It possesses only one town of any note, Kussaibkhaira; bunniah shops 60, pucka houses 12, kutcha houses 194, males 645, females 511.

Havaleè Dowlutabad. The ancient city of Dowlutabad is situated 8 miles north-west of Aurungabad: this interesting locality once the seat of a long line of Hindoo kings, and then known as Deoghiri, is at present nothing better than a miserable cluster of mean huts forming the pettah of the fortress. For any information concerning its earlier history, we are more indebted to tradition, than to historical records, the first time it became known, being in 1294, when Ala ood Deen surprised and captured the citadel. It owes much of its importance to the Emperor Toghlak Mahomed, whom Ferishta describes as being one of the most accomplished princes, and at the same time the most furious tyrant that ever dignified or disgraced human nature; he it was, who entertained the wild project of removing the capital of the dominions from Delhi to the Deccan, by commanding

the inhabitants to depart with all their families and wealth to Deoghiri, and in 1339, the year this event took place, its old name gave way to Dowlutabad, its present one. He erected handsome palaces within the walls and dug a deep ditch all round. Twice the inhabitants were permitted to return to Delhi, and twice compelled to return again, on pain of death. It continued to be the capital until A. D. 1616, when Malik Amber removed the court to Aurungabad, since which period, though lessened in importance, it yet continues to be regarded with jealous anxiety, on account of the nature of its natural and artificial defences, which are very peculiar. A weak wall surrounds the pettah, beyond which, three walls, with gates, are to be passed, before the inner fastness is gained. A narrow causeway crossing a wet scarped ditch, leads to the low entrance of this remarkable stronghold; after which the ascent continues for a considerable distance along a winding gallery, hewn out of the heart of the rock, the nature of which being amygdaloid trap, and not granite as some writers erroneously state, it is readily worked. The upper outlet has a contrivance for securing its mouth in the shape of a huge iron grating which can be laid on, and a fire being kindled upon the bars, would effectually arrest the approach of any assailant from below. The principal objects that arrest attention on looking down from the pyramidal hill on which this fortress is built, are the ruined muhal of Toghlak Mahomed, the governor's house and garden, and the lofty minar built by Ala ood Deen. The handsome building, close upon the summit, was a summer residence of the Emperor Shah Jehan, and crowning the pinnacle is a broad platform, on which a large piece of ordnance is mounted, above which is the flag-staff, bearing the standard of the Nizam. Cisterns of excellent water are hewn out of the rock causing no scantiness of this supply. The prickly-pear, and rank vegetation, have made the inner fort a perfect wilderness, and is in consequence very unhealthy after the rains. It may be remarked, that soils on which the prickly-pear is found are generally those on which the grape will be found to thrive, as mount Etna, for instance, and many other parts of Italy; here the vines are particularly flourishing, as well as other kinds of fruit, figs in particular. The principal towns in the Havalee Dowlutabad are Rouzah and Kaghuzpoora.

Rouzah lies five miles north of Dowlutabad, and twelve from Au-

rungabad in a north-west direction. It is surrounded by a handsome stone wall, erected by Aurungzeebe, but though the houses are substantially built, two-thirds are dilapidated and in a falling condition. The materials for constructing this town as well as Aurungabad, Jaulnah and many of the large tanks on the high table land, were obtained from the ruins of the ancient city of Bhoodda Vuttie, situated on the narrow table land between Rouzah and the Dowlutabad ghat. Rouzah, as its name would imply, is a burial place, and famous as containing the ashes of two Mahomedan saints, Boorawn-u-Deen, and his brother Zer buksh; besides many other holy men, whose tombs have sanctified the spot, and caused it to be regarded by devout Mahomedans, as a Necropolis of peculiar sanctity. There are about thirteen goombuz or domed tombs, and about 1,400 without such buildings. Within the walls of the town are seen the plain tombs of Aurungzeebe and his grandson, Azeemoolshaw, in the same enclosure along with Zinoolhuk Saib, the spiritual adviser of Toghlak Mahomed: close by are those of the Nawab Azif Ja, and Naser Jung, his son. Upon the north of the town, and a short distance from the walls, several goombuz or domed tombs are standing, the principal of which are a large one to the west containing the body of Nizamshah Byree, one of the last kings of Ahmednuggur. The next largest eastward is the tomb of Malik Amber, the greatest financier of his times, and minister to the Ahmednuggur Padsha Moortuzza; near to it stands the goombuz of his wife Beebee Kurreema. A remarkable looking goombuz under the hill, was built by Khoja Feroz for himself, when superintending the erection of the large tomb of Nizamshah Byree his master: several others exist but none, I believe, of any note or consequence. The revenues of several villages are set apart for the purpose of keeping up the repairs of these tombs. There is very little trade in the town; sugar of good quality is made in one or two houses, and a few sarees of silk and cotton. Savaye, a description of vermicelli, is also peculiar to the town as an article of trade. Bunniah houses 32, pucka houses 416, kutcha houses 59, males 1,574, females 1,511.

Kaghuzpoora. A village of large size, the inhabitants of which are exclusively engaged in the manufacture of paper: it lies midway between Rouzah and Dowlutabad. Bunniah shops 8, pucka houses 42 kutcha houses 91, males 605, females 623.

Kooltabad. Burrood, contains a few good houses. It is situated 28 miles north from Aurungabad; bunniah shops 2, pucka houses 32, kutcha houses 69, males 261, females 242. Golagaon; bunniah shop 1, pucka houses 12, kutcha houses 42, males 284, females 235. Kherdee, one of five villages given in enam for the preservation of Aurungzeebe's tomb. Bunniah shop 1, kutcha houses 131, males 283, females 224.

Sooltanpoor. The kusba town of Suttanpoor is in a very dilapidated condition, never having been repaired since it was sacked and burnt by the Pindarees. There are some vineyards at this village. The revenues are appropriated, with six other villages, to the repairs of tombs at Rouzah. Bunniah shop 1, pucka houses 2, kutcha houses 35, males 132, females 114. Gunnooree, an agreeable locality, 22 miles north of Aurungabad. Is held in Enam along with two other villages, for the maintenance of the fort of Dowlutabad. It was a favorite resort of Aurungzeebe, and was held in jagheer by one of his daughters, who planted avenues of mango and tamarind trees around the town, and also sunk wells at intervals upon the road towards the city. A ruined garden house marks the site of the royal abode; a large tank amongst the hills upon the south was built by Syud Budeozam, the patel in Aurungzeebe's time, which is still in good preservation, and at a little cost might again be made available for irrigation. He also built the Surai outside the town, and another above the pass leading to Aurungabad. Sugar cane of a very superior description is grown around the lands of the town. Bunniah shops 23, pucka houses 10, kutcha houses 131, males 524, females 446.

Kingaon, a village famous for its sugar-cane lands. Bunniah shops 10, pucka houses 104, kutcha houses 51, males 623, females 305.

Guddana. Excellent soil for sugar-cane. Bunniah shops 9, pucka houses 11, kutcha houses 82, males 293, females 290.

Taklee. A large kusba town situated in the valleys about 24 miles from Aurungabad in a north-west direction. It has some good houses, and seems to have once been a town of some importance. Bunniah shops 19, pucka houses 5, kutcha houses 201, males 597, females 555.

Sangnee, a town of some note: a juttra is held here once a year. Bunniah shops 10, pucka houses 3, kutcha houses 190, males 434, females 354.

Dhamungaon. Bunniah shops 3, kutcha houses 98, males 263, females 265. Dhurragaon, bunniah shops 3, pucka house 1, kutcha houses 109, males 259, females 298.

Phoolmurree. A large kusba town situated on the banks of the Phoolmusta river, amongst large topes of mango trees. It is 16 miles N. N. E. of Aurungabad. In the neighbourhood are many remains of ancient hindoo temples, the ruins of which have been employed for constructing the town walls, gates, musjeds, and peers shrines. The figures and designs are all clearly and neatly cut, principally representations of Mahadeo and his consort. At the south gate, which is in ruins, a stone with a long inscription in Sanscrit is observed, nothing of which can be decyphered but the date in which the temple it belonged to was built, viz., 1166 of the Hindoo era, agreeing with A. D. 1244, half a century prior to the first Mahomedan invasion. A large town called Veerdar or Beeldar, was formerly existing within a couple of miles towards the south ; nothing now remains but the gate-way. The soil around is remarkably fertile, yielding sugar-cane, and every description of vegetable produce, in the greatest perfection, with the exception of the vine, which cannot be cultivated on account of the destruction occasioned by white ants. Bunniah shops 66, pucka houses 36, kutcha houses 487, males 1,683, females 1,533. Babra ; bunniah shops 97, pucka houses 12, kutcha houses 403, males 1,084,females 1,067. Waragaon ; bunniah shops 11, pucka houses 3, kutcha houses 183, males 445, females 413. Khamgaon ; bunniah shops 7, kutcha houses 206, males 386, females 390. Khaigaon ; bunniah shops 3, kutcha houses 169, males 399, females 376. Burrode Burra ; bunniah shops 9, pucka houses 3, kutcha houses 151, males 307, females 293. Peerbowdee ; bunniah shops 27, kutcha houses 158, males 371, females 305. Dhamungaon, bunniah shop 1, pucka houses 4, kutcha houses 161, males 323, females 299. Woomrowtee ; bunniah shops 2, kutcha houses 129, males 274, females 268. Neellode ; bunniah shops 4, pucka house 1, kutcha houses 81, males 235, females 317.

Kunhur. A large kusba on the banks of the Sewna river, distant 33 miles north north-west of Aurungabad, formerly a station of the Nizam's contingent, and now the residence of the Company's Bheel agent. Vineyards and orange groves, are found in a very flourishing condition around its neighbourhood. Bunniah shops 66, pucka houses

149, kutcha houses 398, males 929, females 836. Andhanair ; bunniah shops 5, pucka houses 2, kutcha houses 116, males 340, females 314.

Gowtala. This purgunnah contains only five villages, which, with the kusba, are all deserted excepting Dondgaon, a small hamlet of 8 males and 11 females.

Untoor. This purgunnah is delightfully situated amongst the hills upon the north, occupying two lengthened valleys, which are divided by a lofty narrow ridge, that is impassable for wheel carriages. The fort of Untoor is placed upon a narrow spur projecting into Kandesh; the form of the hill it stands upon is nearly square, and about a mile in circumference. A natural scarp of about 700 feet surrounds it on all sides, excepting towards the south, where it has been scarped by art. It was well supplied with water, and presents an excellent instance of a hill fort rendered impregnable, by its natural defences. It has a Rajpoot garrison, and a pettah containing about 12 houses. The plateau, extending between this fort and Nagapoor, is composed of disintegrated trap and porphyritic rock, presenting a very desirable site for a sanitarium. Undharee ; the kusba town ; bunniah shops 34, kutcha houses 288, males 698, females 617. Nagapoor, very pleasantly situated on the banks of the Poorna ; bunniah shops 16, pucka houses 26, kutcha houses 213, males 615, females 590. Peeshoor ; a large town on the banks of the Unjaina; river; bunniah shops 74, kutcha houses 279, males 690, females 638. Kurrung Khaira ; bunniah shops 18, pucka house 1, kutcha houses 246, males 604, females 520. Pulsee Tiggee ; bunniah shops 19, kutcha houses 127, males 699, females 616. Saindra ; bunniah shops 20, pucka house 1, kutcha houses 198, males 415, females 387. Karulla Degruss ; bunniah shop 1, kutcha houses 178, males 402, females 400. Urgaon ; bunniah shops 8, pucka house 1, kutcha houses 109, males 285, females 236. Navepoor ; bunniah shops 26, pucka house 1, kutcha houses 130, males 258, females 253.

Saitoonda. Kusba Ghatnaundra ; bunniah shops 19, pucka houses 6, kutcha houses 316, males 814, females 754. Umbae ; bunniah shops 33, kutcha houses 239, males 469, females 395. Umthana ; bunniah shops 14, pucka house 1, kutcha houses 145, males 373, females 336. Davulgaon ; bunniah shops 4, kutcha houses 199, males 331, females 306. Charnair ; bunniah shops 5, kutcha houses 141, males

354, females 338. Ralegaon ; bunniah shops 7, kutcha houses 108, males 295, females 266. Chicholee ; bunniah shops 15, pucka houses 5, kutcha houses 101, males 245, females 333.

Roads and Communications.

From the variable nature of the face of the country the roads throughout the Circar are proportionately difficult for communication, though generally speaking they are pretty good, or might readily be made so, water seldom hanging, and the materials for metalling being close upon the surface ; the greatest inconveniences are the occasional beds of black soil found in the lower levels, which render the roads impassable in the rains where they occur, and also the sides of the nullahs in the same localities, having banks of soft alluvial earth rendering in such cases even passage for bullocks a difficult matter; however towards the hills, a rocky shallow soil prevails, on which carts may travel the whole year round. If the hill be hugged too closely, deep nullahs occasionally obstruct the road, but this inconvenience is easy of remedy at trifling cost, by sloping in and out, and paving the centre, with stones sufficiently large, to withstand the impetuosity of the hill streams.

Passes. The passes by which the higher plateau towards the north are gained, are through the Chowk ghat, a steep and rocky ascent passable for carts, leading to Phoolmurree. The Gunnooree ghat, passable for carts, and a winding stony and steep road up the side of the hill, leading to Gunnooree. The Dowlutabad ghat, a broad ascent of nearly half a mile, sufficiently easy until near the summit,when it becomes very steep ; passable for carts, but not very generally used. Besides these there are two or three bridle roads, and footpaths, as well as another ghat at Elloora.

Upon the north-west there are four passes in what is called the Adjuntah, or Sat Malla range, all passable for carriages. These are the Adjuntah ghat not within the Circar. The Gowtala ghat, lately made passable for wheel carriages ; the ascent though difficult for traffic, is easily managed with light loads, and has been much used since the repairs, that lately have been made. It may be kept in its present state, at no great cost, and is of great convenience.

The Purdaree ghat is a made one, and has a good and easy ascent for loaded cattle.

The Kussara, or Kassarbarra ghat, enters the Nuggur districts near the village of Waukly. This too, though not a made road, is a very good and passable ghat for loaded carts. About ten miles south of this pass, the Sat Malla range slopes away into the Nuggur country, and in so gradual a manner, as to permit a carriage being driven over it with ease. Besides these passes for wheel carriages, there are many along the range available for loaded tattoos and bullocks, and foot passengers.

Upon the event of a railway passing through Kandesh, the route it should adopt has been suggested as being one, that would command easy access to the principal lines of traffic from the Nizam's frontier, as for instance the cleared road from Nummaur to Mulcapoor, which is well suited for the purpose, being a good level bit of country: should this ever be accomplished, the ancient road from Aurungabad to Surat, will be the best line for the traffic, passing south of the Adjunta ghats, the remains of this old road are distinctly visible; in some places the pillars that marked its distances, are still standing. The tapal road from Bombay on entering the Circar at Toka, traverses a flat level throughout and consequently is much obstructed by nullahs, and heavy soil: the worst nullahs have a light wooden bridge thrown across them, sufficiently strong to allow the horse tapal to cross.

Population.

The census has been made from returns furnished by the Putwarrees of each town and village, the truth of which I am inclined to believe, though probably the estimate may be found rather under than over the real amount.

The scanty population of these districts arises from their having in former days been afflicted with several awful visitations of war, famine, and pestilence; the effects of which have been as disastrous as lasting; the greater part of those who did not fly the country perished through destitution, or by disease induced thereby; and where destruction of human life occurs to such a frightful extent, as has been witnessed within these districts, during the last half century, it takes many generations to restore the population back to its original strength.

Famines. The famines that have desolated the land during the last fifty years amount to four, indeed we may say five, for the scarcity prevailing in 1846, may fairly so be termed.

1787. The first occurred in 1787. Grain selling for nine seers the rupee. The second and most dreadful of

1802. all happened in 1802, fearfully aggravated by the horrors of war; the marauding hordes of Holcar, under Ameer Khan, having carried havoc and destruction through the country the preceding year, destroyed the harvest, and grain was sold at one rupee for a seer and a half; thousands perished from inanition, or fled; and so dire was the scourge that to the present day the revenue has never recovered the shock; whole tracts of valuable land then covered with towns and villages, are now lying desolate, which forty years ago yielded rich returns to Government. This is particularly the case between the Gowtala ghat and Byzapoor, but were I to particularize every locality thus impaired, I should have to name every town and village of any note,

1825. throughout the Circar. The third famine was in 1825: grain sold at 9 seers the rupee. The fourth was in

1834. 1834, and grain sold at 12 seers the rupee. The

1846. fifth occurred in 1846, when grain was sold for 15 seers the rupee, being just double the usual price. Much sickness prevailed amongst the poor in those districts, where the dearth was most felt; cattle dying in great numbers, and in many places the fowls have completely disappeared.

The gross estimate of the population amounts to 1,54,767, exclusive of the city of Aurungabad, of this 1,38,376 are Hindoos, and 16,391 Mahomedans; or one Mahomedan to eight Hindoos, and averaging 5 persons to a house.

In the abstract of the census there is shown a preponderance of males over females, a result in some degree corroborative of its truthfulness, as such is found to be the case in all countries where the censuses have been accurately taken. In England the census of 1830, gave males to females in the ratio of 19 of the former to 18 of the latter; the returns here show something in excess of 88 females to 100 males, the respective numbers being males 82,075, and females 72,692, and here a curious circumstance is perceived in the fact that adult females bear a larger proportion to adult males, than girls do to boys, and that it is owing to the excess found in male children,

that the preponderance of the male sex ultimately takes place: as for instance, in every hundred men, there are 98 women, but in every hundred boys, there are but 71 girls. One way to account for this remarkable fact, may be explained in the custom that obtains in the East, of classing girls as women, at a far earlier period, than is the case in Europe. Respecting births and marriages, the prejudices of the natives prohibited all attempts at obtaining information under this head. The returns of deaths present a high rate of mortality, being 1 in 26: the average rate in Java is 1 in 40, and in England 1 in 51. This excessive mortality may have been the case, as the census was taken for the year 1846, which was one of extreme distress, occasioning much sickness of a depressing nature, cholera alone amounting to nearly the half of the casualties, small pox about a fifth, fevers a tenth, and other disorders about a third. Of the diseases incident to the inhabitants, fever as usual prevails most generally, and is often found of a serious nature towards the hilly country, or amongst the broken banks of ravines, which are generally depots of malaria; rheumatism, and spleen disease, are always rife in such localities. Blindness is a common calamity, generally arising from structural disorganization of the eye, the ravages of small pox, a disease that annually scourges the population to a very serious extent in common with cholera. Leprosy of the skin, is less common than in its more hideous form, affecting the joints. Guinea worm is occasionally seen, but is not common, neither is stone in the bladder.

The following table shows an analysis of the population according to their arrangement by castes.

	Population arranged in Castes.				
	Brahmins.	Rajpoots.	Shoodrahs, &c. Mahratta Cultivators.	Atee Shoodrahs or Low Castes.	Moossulmen.
	Per Cent.	Per Cent.	Per Cent.	Per Cent.	Per Cent.
Circar Dowlutabad....	5·455	2·395	67·513	12·435	10·298

We see from this analytical summary, that the bulk of the people is composed of Shoodrahs, nearly to the extent of three-fourths of the whole; and that upwards of two-thirds of this useful class, are to be found engaged in cultivating the soil. The Koonbees number 25,675, which in a population of 1,54,767, allowing five persons to a family, gives 1,667 per cent. of the people engaged in agriculture. It is to be understood that this calculation does not include the city of Aurungabad.

The Brahmans do not appear to be a large class, not numbering above one in twenty persons. The Rajpoots or Purdaisees are about one in fifty, and are principally the descendants of the troops entertained and settled in the country by Aurungzeebe. The low castes are met with in the proportions of something less than one in nine. Of these the Mhars or Dhers, are a very numerous body, forming two-thirds of the whole number. Bheels about one in twenty. These wild people are found principally in the western parts of the Circar, where they act as village guards. The Mangs, who are also employed at many places in the same capacity, are nearly of the same strength, being about one in seventeen.

The habits of the people are disposed to peacefulness, and they are sober, frugal, long suffering, and intelligent; the Koonbees for many centuries have followed the great business of life, the tillage of the soil, with infinite skill and industry. Amongst each other they are reported to be sincere and honest, but where the reverse occurs, it will generally be found to arise from their taking refuge in finesse, the only weapon the weak possesses against the strong, this system of dissimulation is more one of necessity than choice; that it exists there is little doubt of, but much is to be conceded in favor of people so circumstanced, as we find the poor ryots, whose extreme poverty has plunged them into irretrievable embarrassments, rendering them apathetic, and heedless for the future.

Education. Education, such as it is, may be stated as being exclusively confined to the Brahmans, shopkeepers, soucars, and upper classes of Mahomedans. Sixty schools, at which 813 pupils receive instruction, are in no way proportionate to the amount of population, the general illiterateness of which, may be best understood by the fact, that there are only found 3,627 persons able to read and write, or two and a half per cent. of the entire population,

exclusive of the city of Aurungabad. The amount of education embraces just such a sufficient knowledge of reading, writing, and arithmetic, as suffices for carrying on ordinary business in the bazars. The rudiments of which are first mastered by writing with a stile upon a board sprinkled with sand, or brick dust, and afterwards by writing with a fluid of pipe-clay and water, on a painted board. The language spoken throughout the Circar is Mahratta.

Police. In each purgunnah, the office of Cazi is hereditary, a custom, which causes many instances of the duties being exercised by inefficient persons.

The real police of the country are in fact the Jaglias, whose duty it is to trace robbers any where within their own precincts, beyond which, the responsibility falls upon the Jaglia of the next village. These persons are supported by huks and russooms, and are taken from the Mangs, Bheels, or even Dhers, as the case may be. The Purdaisee villages, that is, the Zemindars of which are Rajpoots, have no native Jaglias but depend on their own arrangements for police protection. Dacoity, and large gang robberies are put down by Seebundee troops under the Talookdar, assisted by the village Jaglias.

The passes through the ghats bordering Kandesh, are guarded by Chowkedars, acting under the orders of the officer commanding the hill rangers, and supported by detachments of regular troops from Aurungabad and Booldanah.

The whole system of police appears of a very unsatisfactory nature, being apparently guided more by arbitrary principles, than any thing recognized or fixed, whilst the ordinary practice of the Adauluths in criminal law, is very dilatory.

The Zillah Umeen is the head of the civil and criminal courts, both in the city and districts. In the latter the common cases are generally disposed of by the Aumil, who submits the matter to his superior farming the revenue, for summary decision, or a still further reference to the Zillah Umeen.

Punchayets are taken advantage of by Mussulmans as well as Hindoos, in special cases, where arbitrations are involved, the contending parties before the court sits binding themselves strictly to abide by the award.

Commerce.

There is very little trade carried on within the Circar, commercial transactions being all of little amount, and confined principally to a mere exchange of commodities for internal consumption. Its grand export is dry grain, which with sugar and culdee, form pretty well the entire amount of exported produce. Manufactures are confined to the wants of the community with the exception of a small quantity of brocade, silk goods, and a trifling amount of cotton cloths. The return trade is salt, iron, copper vessels, cotton cloths, and some other articles of less note for domestic use.

The grain trade is in the hands of a few native merchants, the principal of whom resides at Toka, employing agents at Aurungabad for supplying the consumption for large towns and the export trade to Bombay. In making their purchases, three methods are generally resorted to, the necessities of the poor Koonbees giving the advantage in every case, to the buyers. The first is called "Deodee" and is an agreement on the part of the cultivator, to return one pullah and a half of grain at harvest time, for every pullah given in the sowing season ; the second is called "Rungoda," when a price is fixed upon the grain in ear, and money advanced upon the probable produce it yields ; and thirdly, the collectors of grain advance the Government instalments when the grain is ripe to cut, at the rate of 25 per cent., stipulating for the loan being paid in ready cash, compelling the sale of the grain often at a loss, when the lenders usually become the purchasers, often times below the bazar price.

Excepting in large towns the population subsist on the produce of their own immediate neighbourhood ; their clothing is generally imported from Berar, cotton goods forming but a very trifling item of the manufacturing industry ; the plant not being cultivated in the Circar. Blankets of black wool, are made in every village by the Dhers, one man can make two a month, which he sells from 8 annas to one rupee each. In several places, a strong hempen canvass called tat puttee is made, the breadth of which is about half a foot.

The weaving of mixed goods fabricated from silk and cotton, called mushroo, is carried on languidly at Aurungabad, and Rouza ; and more briskly at Byzapoor ; the filature silk is imported from Bombay. Brocade is alone manufactured at Aurungabad, as well as gold thread.

Not being able to procure the amount of exports and imports, it is impossible to draw conclusions as to the state of trade between the Nizam's country, and the Company's, and I must therefore defer doing so until in possession of these documents.

The principal return trade of grain from Bombay is salt and iron. From inquiries in each Purgunnah, I have been able to calculate the amount annually consumed of salt as about 11,607 pullahs 1 md. 23 srs., which, with 300 pullahs to be allowed for the consumption of the city of Aurungabad, gives 14,607 pullahs as the gross amount. The consumption of this article upon an average amounted to three quarters of a seer a month, each individual; the price was 2 dubboo pice a seer.

Iron is received from Bombay and Bhewndy in sheets and rods, and from Nerinul in small bars; nearly the whole is employed for agricultural purposes, very little being used for building. Bullocks are never shod, neither are the tattoos of the villagers.

The annual consumption of iron as returned to me by the district officers, amount to 425 pullahs 1 md. 36 srs. from Bombay, and 178 pullahs 0 md. 34 srs. from Nerinul; which added to what is expended in the city, viz., 31 pullahs 0 md. 13 srs. makes in the aggregate 638 pullahs 1 md. 26 srs., therefore estimating the land under cultivation at 14,18,938 beegahs, there will be found to be expended about 15¼ pounds of iron upon every square mile of cultivation.

Sugar Manufactory.

Manufactures.

The first part of the process is undertaken by the farmer upon the field, who there expresses the juice, and boils it to a thick consistency called "Rab," sometimes carrying the evaporation further, reducing it to goor or Muscavado sugar, in which state it is disposed of to the Hulwai, or sugar refiners, who deprive it of its impurities, and render it fit for the market. The mills employed for crushing the cane are a great improvement upon those formerly in use, the shattered fragments of which are to this day seen around most of the villages throughout the Circar, supplying in their ruins, the silent evidences of a former flourishing condition of the manufacture of sugar. The old mill was a large block of stone hollowed out, and the juice of the sugar cane very rudely press-

ed out, by the means of a large wooden pestle, crushing the stalks against the sides. The common oil mill of the country is precisely of the same description; the mill that had superseded this rude machine, has two solid vertical cylinders, made from baubul wood, the heads of which are cut into the shape of endless screws, whose spiral grooves and ridges, four in number, interfold with each other on being put in motion, which is managed by a long horizontal lever fixed to one of the cylinders in its centre, and at either end of which, a pair of bullocks are attached, the height of these rollers is 5 feet, the head of the screw being one-third of the whole: the diameter is 2½ feet, below the screw head, the surface is scored with narrow channels forming horizontal rings round each cylinder, which is done to assist in obtaining a firmer hold of the cane, and allowing the expressed juice the better to escape. As it trickles down these crushing rollers, it is received into a shallow gutter surrounding the mill bed, and passes from thence by an under ground channel, into a large receiver made of earthen-ware, sunk into the ground to be ready at hand for the operation of boiling. The apparatus for this purpose is so arranged as to allow the boiler to be on a level with the juice receiver, the fire-place being excavated so as to admit of this adjustment. The juice is now boiled rapidly, for four hours and a half, adding nothing to correct acidities and assisting it no further than in skimming off diligently the scum as it rises to the surface, when sufficiently inspissated, it is poured into a shallow circular hollow, formed in the floor of the mill, and stirred and raked about to cool and granulate; when sufficiently cooled it is poured into holes made in the ground, round the sides of which a coarse cloth has been passed, so that when perfectly hardened, the cloth is pulled up, and the goor detached. These weigh each on an average, about thirty-five seers, and are found more convenient for carriage, than when the inspissation has not been carried farther than leaving it in the state of fresh honey, as is the case when it is sold as rab; in this state it is poured into large earthen jars holding four maunds, four of which are a load for one gharree. Though rab is more liable to damage by keeping than goor, and less convenient to transport, yet the Hulwai prefers it, on account of the difficulty there would be in its adulteration, whilst goor admits of its qualities being lowered by mixture with impurities.

In making sugar, the first thing the Hulwai does, is to fill with rab a large closely wattled bamboo basket, five feet high, and twenty feet in circumference, capable of holding about forty pullahs of rab, the basket stands upon horizontal poles, having a well beneath, sunk in the floor, into which drips the draining from the baskets, which is called "kaki," or molasses. It is allowed thus to remain for fifteen days, when from the consistence of honey it will have been found to have taken the appearance of Muscavado sugar, the plan for freeing it of its gluten, and other impurities, is accomplished by a series of "meltings," as it is termed in the West Indies: that is, breaking up the crystallized mass, and forming the whole into a pap, with a mixture, as thus prepared, five seers of salt, two seers of soda, one seer and a half of the cuttings of the euphorbia tiraculli; one seer of cuttings of the euphorbia ligularia, and one seer of the ashes of the plantain tree, the whole to be boiled for one day in two maunds of water, strained and mingled with the raw sugar into a pappy state, after which it is allowed to drain for ten days, when the same process of melting is again performed, with this difference, that this time the several ingredients are diminished, there being but one seer of salt, one seer of soda, one seer and a half euphorbia tiraculli, one seer of euphorbia ligularia cuttings, and one seer of plantain ashes with only twenty seers of water. Five days are now sufficient to drain the crystallized mass, after which the surface is covered to the depth of four fingers, with plants of the vallisneria verticellàta, removing them every third day until the process is finished. About twenty seers of sugar are usually found encrusted on the surface at each removal; the time required from the first steps of refining to bringing into this condition occupies about ninety days, and fits it for the remaining operation, which is to clarify the sugar, and is thus performed: one maund of the prepared sugar is dissolved into a thick syrup, by first adding three seers of water, and boiling gradually, adding to this, fourteen more seers of water, with two seers of milk; the impurities being carefully removed as they arise upon the surface. The clarified syrup is then gently evaporated to the point of crystallization and left to evaporate, and crystallized in the sun and air, which, when effected, the crystals are crushed fine, and in this state it is sent to the market. This sugar is very sweet, and of a very fair white color.

Forty pullahs of rab when thus converted into sugar, and refined,

gave on an average forty maunds of sugar, sixty maunds of kaki or molasses, and twenty maunds of waste, the expenses attending which would be as follows:

	RS.	A.	P.
Forty pullahs of rab,	680	0	0
Carriage to refining house,	5	0	0
Expense of bamboo basket,	1	0	0
Wages to labourers,	46	0	0
Wages to sugar refiner,	12	0	0
Tank weed (by the job),	4	0	0
Ingredients for melting,	1	10	0
Firewood,	10	0	0
Milk,	4	0	0
Hire of iron cauldron,	20	0	0
Mats,	0	4	0
House rent,	2	0	0
Hyd. Rupees	785	14	0

Forty maunds of sugar sells for rupees 720, at 18 rupees a maund, and sixty maunds of kaki or molasses for rupees 180, at 3 rupees a maund, making altogether rupees 900 for the batch, out of which, when the expenses of its manufacture have been deducted, there will remain a balance of rupees 114-2 as the profits of the manufacturer.

Paper Manufactory.

The process of paper making is followed on rather a large scale at the village of Kaguspoor, midway between Rouzah and Dowlutabad. The whole of the village employs itself in this business; the inhabitants of which, with a few exceptions, are all composed of Mahomedans. The cold season is the one most favorable to their purpose, as not only is water then more plentiful, but there are not blowing those high winds so prevalent in the hot months, and which interfere very seriously with the process. The manufacture has of late years greatly declined, and still continues to be depressed, no reasons for which were assigned.

The materials out of which the paper is manufactured, are old remnants of tat puttee, and gunnee bags, which being cut into pieces about an inch square are subjected to a pounding under the "daik-

lee" for a whole night. In the morning the beaten shreds are carried to the tank, and all dust and dirt removed by washing, which is thus managed: a long cloth has its two ends made fast round the loins of two men, who enter the tank, and commence stirring the shreds well about in the cloth between them, by which means it obtains a very effectual cleansing, after which it is returned to the "daiklee," and adding lime, in the proportion of one maund to three maunds of shreds, is again well pounded by the "daiklee" for eight days, and then left quiet for a week, when after repeating this alternate operation of pounding and resting, it is submitted to a thorough washing to detach every particle of lime from the mass, which when effected, soda and soap in equal proportions are added; four maunds of each to every three maunds of pulp, when another pounding is given, and the mass left in heaps for a day. On the following one, it is well washed, and laid out to dry and bleach for four days. When the moisture has by this time all escaped, the dried substance is rubbed by the hand upon a chunamed floor, sifting it afterwards to allow the dust to pass away, when three maunds of soap to the same proportions of pulp are used, and again beaten for eleven days, again washed, and again dried and bleached, when it is further reduced to a pultaceous consistence with water for use, by beating and treading in a circular hole, made of chunam for this purpose, from thence the pulp is removed into a cistern for use. This cistern is four feet by five wide with sides sloping towards the base, and is three feet deep.

The moulds consist of a frame-work adapted to the size of the sheets required, with narrow rims, having bars placed lengthways, their edges presenting, and an inch a part; upon the frame is laid a fine chick made of a peculiar grass, and kept firmly fixed by securing the edges with two flat sticks, that fit in at the top and bottom of the frame; the moulds being prepared, the workman who sits squatted close to the edge of the cistern, stirs up the pulpy matter with a stick and then dips the frame vertically in the cistern, gradually inclining the lower part upwards, so that by the time it reaches the surface, it lies flat upon the water; he then carefully and quickly notices those portions in which the pulpy matter lies uneven, and remedies by again dipping the frame into the cistern, making all smooth and even by a series of almost imperceptible jerks and shakings of his wrists; after a short time the chick is raised, and the newly formed

sheet turned over on a heap, beside the workman; from whence they are taken away in their wet state, and fixed against the walls of the house, both on the inside and out, for which purpose the walls are kept very clean and smooth, an appearance which cannot but strike strangers as they pass through the village, after having been accustomed to the neglected state of native houses generally prevalent in the Mahratta country. When dried they are taken down, and rubbed over by the hand with thin paste, and again dried, after which it undergoes a glazing process by means of a smooth polished stone, being rubbed over the dried sheets upon the board, the form of which is slightly concave.

The better sorts of paper require a longer manipulation, than the inferior kinds, the finest kinds of all take six months preparing.

Remnants of tat-puttee cost 9 rs. to 12 rs. per pullah; old ropes, that are used for the commonest description (shurbuttee) cost 3 rs. per pullah. The soap is procured from Berar, and is bought at rupees 30 per pullah; the soda is procured from the Loonar lake and costs 5 rs. 12 as. 9 p. per pullah.

The quantity of soda, lime, and soap used, varies with the description of paper made. For the manufacture of a ream, for instance, of the finer sorts, two seers and a half both of soda and lime, are required, and seven and a half seers of soap; whilst for the common kinds but one seer of soda and of lime, and but three seers of soap are necessary. Eight seers of tat-puttee is the quantity required for making a ream of paper.

The expense of labor employed upon the better kinds of paper, as the Bahadoor Khana, is as follows for one ream:

	RS.	A.	P.
Eight seers tat-puttee, - - - - -	0	8	6
Pounding the tat-puttee, - - -	1	3	0
Soap, - - - - - - -	1	13	0
Soda and lime, - - - - -	0	2	0
Washing, - - - - - - -	0	12	0
Making into paper, - - - -	0	4	6
Drying and cutting, - - - - -	0	3	0
Glazing and pasting, - - - -	0	9	0
Rupees...	5	7	0

The cost of preparing three pullahs of tat-puttee would be as follows:

	Rs.	A.	P.
Lime,	1	0	0
Soda,	3	0	0
Soap,	90	0	0
Wages,	72	0	0
Total...	166	0	0

There are six sizes and varieties of paper here made, which with their dimensions and prices are here given:

	Breadth. Feet.	Breadth. Inch.	Length. Feet.	Length. Inch.	Rs.	A.	P.
1. Nizammool khanna,	2	6	3	0	36	0	0
2. Bahadoor khanna,	2	2	2	6	9	4	6
3. Shaishta khanna,	1	7	2	0	4	12	6
4. Moradar,	1	2	1	6	1	14	0
5. Nizamshae,	1	2	1	4	1	8	0
6. Shurbuttee,	2	0	1	6	0	12	0

Manufacture of Salt Petre.

The manufacture of Salt Petre is principally confined to a few villages lying between Gandapoor and Byzapoor. Between these towns, a tract of land exists, much mixed up with calcareous earths, by the admixture of which, with animal matter, the spontaneous generation of nitre is greatly facilitated. The source whence this salt is obtained, is the white earth, or pandre muttee, to be seen no where but in the vicinity of habitations, and would seem to have obtained its compact texture and white color from some unexplained action of the atmosphere, upon a soil, strongly imbued with animal matter. The nitrogen present in such earths, uniting with the oxygen of the air, forms nitric acid, and is immediately fixed by the potash, found existing in many basaltic soils, forming by its union, nitrate of potash, or saltpetre.

There are two processes adopted for procuring saltpetre, the one by evaporating the solution containing the salt in large iron vessels, and the other by boiling the liquor to a certain density, and then evaporating the liquor in large shallow pans, or chunam beds.

The first operation is only followed during the cold months of the year, the white earth containing the salt is collected from scraping old walls and roads about the village, and a certain quantity thrown into a shallow cistern about four feet in diameter and two feet deep; water

is then poured in till it covers the earth, and is then well stirred together. After a day's digestion, the water is allowed to drain away laden with saline matter: by opening a hole made for the purpose, at the bottom. The lixivium thus obtained, is then boiled rapidly in an iron pot for twelve hours, removing the scum as it rises, and then poured into small earthen pots to cool and crystallize, which are placed edge-ways to drain: it receives no further preparation; and in this state is of a reddish brown color.

One boiling of the iron pot in use, will produce twelve seers, and the price it sells for is 10 rupees a pullah.

People necessary for the operation are three men for scraping and bringing the white earth, at two rupees a month. Three men for chopping wood and bringing water, and two men for attending the furnace, and boiling, each at three rupees a month.

Wood being scarce in the part of the country where the manufacture is carried on, the operation is made dearer than it otherwise would be, each boiling consuming half a rupee's worth of fuel. The work goes on by night as well as during the day.

The other mode is adopted during the hot season and requires a high mound of earth, at the foot of which are placed the shallow chunamed pans for evaporation; on the summit of this mound, the white earth is lixiviated, and after being boiled in an iron pot, is poured into channels that convey it down the sides of the mound into the pans below, depositing its earthy particles as it passes along, and when evaporated, the crystals deposited are swept away and packed for sale.

Pottery.

A coarse manufacture of porous unglazed earthen pots called mutkas is carried on in every large sized village, the process of which is as follows. A particular sort of black clay is procured from the nullahs, and tempered by admixture with horse dung and ashes, and well trodden for a whole day under foot; the method of forming the tempered clay into vessels is done by placing a lump of it upon the centre portion of a horizontal wheel, applying rotatory motion before doing so, the velocity of which is greatly increased by whirling it round briskly two or three times by means of a stick fixed in holes made for the purpose on its outer rim.

The wheel is a very simple affair, having a disc placed in the centre,

sixteen inches in diameter, on which the clay is thrown for working into shape, and from the sides of which eight spokes proceed to the outer rim, whilst below there is a hole which receives the spindle it turns on ; this spindle being the point of a bullock's horn, let into a round stone. The entire diameter of the wheel is three feet, and its breadth three inches. The frame work is made of baubul wood, the bulk of the outer rim being composed of clay, goat's hair, and horse dung, altogether not weighing above forty seers.

The potter accurately guessing the quantity of clay required for his purpose detaches it from the mass, and casts it on the centre of the wheel, now in rapid motion ; when dipping his hands in water, he works the lump up into a pyramidal form, and then down into a flat shape, repeating this until he has deprived the mass of any air bubbles it may contain. In this operation, the fingers are placed inside with the thumbs outside the lump of clay, a piece of wet rag smooths the lips of the vessel and a thin string drawn between the mould and the disc, separates it from the wheel. The vessel thus shaped, is now removed to a shady place to permit its drying to a particular point, when it is further prepared by being beaten into its proper form, by a flat wooden mallet, it possessing in this stage peculiar tenacity, admits of this hammering into shape, which is effected by placing a convex stone on its inner side, on which the hammering acts. Whilst this process is going on, the potter is continually sprinkling the beaten parts with fine rice-straw ashes, when sufficiently beaten into form it is again put by for two days under shelter, and covered with damp sand, after which it is subjected to a further hammering, and then burnishing the surface, the potter places it as before in a shady covered place to dry, and in a fortnight it is fit for burning. These pots bake black, are very brittle, breaking on the least violent usage, but their small price renders this of less consequence, a large sized mutka costing but one pice ; their porous nature keeps water contained in them very cool.

Silk Manufacture.

There is a considerable trade carried on at Byzapoor in the manufacture of silk and mixed goods called mushroo ; employing one hundred and twenty-five looms in the process, and ten houses for silk throwing. Besides these looms, there are fifty also for making cotton cloths.

The raw silk is imported from Bombay at twelve rupees a seer, and when prepared at seventeen rupees a seer, the declared value of the manufacture exported last year was rupees 37,500, the price of 6,250 pieces.

The places the silk goods are exported to are principally to the great fair at Mhajee in Kandesh, Nassuck, Nuggur, Yeola, and Parola.

The daily wages of the work people are four annas a man, two annas a woman, and one anna a boy: the number of operatives employed are 112 Hindoos, and 13 Mussulmen.

The number of hands required for each silk throwing machine, is five. The cotton weavers are all Hindoos and receive four rupees a month wages.

Weights and Measures.

The subject of weights and measures having been considered, when reporting upon the city of Aurungabad, leaves nothing to be added to what has already been given, further than stating that some discrepancies in the value of the beegha were occasionally found occurring throughout the Circar; for example, at Aurungabad, the beegha is a square of 40 rods, the length of each rod being 43 inches, forming a superficial measure of 2,958,400 square inches English = 2,282 928* square yards, or very little less than half a British acre. Elsewhere it is a square of 20 rods, or pands, each rod measuring 85 inches, that is a superficial measure of 2,890,000 square inches English, 2,229·1,216 square English yards. There is a smaller rod in use for measuring baghaet lands which is shorter than the above, by 8 inches in every pand.

Lending and Borrowing.

The regular established rate of interest is 8 annas per cent. per mensem, amongst the Soucars themselves, who increase this up to 2 rupees per cent. in times of emergency. To traders, usually from 10 annas to 1 rupee per cent. per mensem is allowed, according to their degrees of credit and responsibility; whilst from persons not engaged in trade, from 12 annas to 2 rupees is demanded.

(Signed) W. H. Bradley, Surgeon,
8th Regt. Nizam's Infy. on Special Duty.

Boldanah,
September 8th, 1848.

* Erroneously stated in a former report at 2,210 square yards.

Return of the Revenue in the Dowlutabad

	Land Revenue.			Mohturpha or House and Shop Tax.			Sayer.			Arrack.			Toddy.			Grazing Cattle.			Rumnas.		
Hursool, - -	19,736	3	6	129	0	0	0	0	0	297	6	0	175	0	0	0	0	0	534	11	0
Havalee Aurungabad, - - -	7,692	12	9	65	4	0	0	0	0	377	0	0	330	11	0	0	0	0	0	0	0
Sittarah, - -	4,320	11	9	0	0	0	0	0	0	55	0	0	0	0	0	0	0	0	0	0	0
Wallooj and Toorkabad, - -	52,076	11	0	725	0	9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Saitoonda, -	22,537	11	9	731	15	0	385	3	9	249	11	6	7	0	0	0	0	0	0	0	0
Kooltabad, - -	13,867	11	0	21	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Dowlutabad, -	8,115	2	0	15	0	0	1,621	0	0	15	12	0	25	0	0	79	0	0	62	0	0
Elloora, - -	17,271	9	3	363	4	0	226	9	6	109	0	0	0	0	0	0	0	0	17	4	0
Sooltanpoor, -	17,772	5	6	143	4	0	238	8	0	25	11	0	0	0	0	0	0	0	51	9	6
Taklee, - -	11,369	1	3	138	8	0	41	0	0	27	0	0	0	0	0	18	14	0	0	0	0
Phoolmurree, -	70,318	12	6	469	10	0	516	6	0	30	0	0	2	0	0	0	0	0	15	0	0
Kunhur, - -	18,878	14	3	163	3	0	3,773	9	6	1,137	4	0	12	0	3	169	4	0	0	0	0
Gowtala, - -	416	1	6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Untoor, - -	53,631	2	6	462	4	9	876	13	6	238	8	0	5	0	0	450	0	0	0	0	0
Khanapoor, -	8,052	15	9	154	8	3	327	11	0	34	2	6	0	0	0	19	0	0	0	0	0
Khundala, - -	12,571	6	3	124	8	0	598	0	0	0	0	0	0	0	0	23	6	0	0	0	0
Gandapoor, -	78,169	8	0	845	11	6	2,628	8	3	48	0	0	0	0	0	16	0	0	0	0	0
Byzapoor, - -	39,439	10	0	1,320	9	9	1467	0	0	30	0	0	12	0	0	0	0	0	0	0	0
Total..	4,56,238	6	6	5,872	11	0	12,700	5	6	2,674	7	0	568	11	3	775	8	0	680	8	6

rcar for the year 1845-46.

Fines.			Mango Groves.			Salamee or Presents.			Sundries.			Gross Amount.			Gaon Khurch.			Amount of Revenue appropriated after deducting the Village expense.			Amount of Revenue alienated.		
0	0	0	187	3	6	23	0	0	4	0	0	21,086	8	0	3,610	3	6	10,177	13	3	7,298	7	3
0	0	0	243	1	0	0	0	0	327	2	0	9,035	14	9	1,396	15	3	5,098	0	6	2,540	15	0
0	0	0	194	12	0	58	3	9	0	0	0	4,628	11	6	1,252	15	0	1,716	3	9	1,659	8	9
0	0	0	0	0	0	0	0	0	0	0	0	52,801	11	9	7,164	1	6	42,480	6	0	3,157	4	3
135	3	6	129	8	0	29	6	0	202	6	0	24,407	12	0	4,902	6	9	19,505	5	3	5,425	4	0
0	0	0	196	0	0	0	0	0	0	0	0	14,084	11	0	2,754	15	3	5,904	7	9	2,438	3	0
150	0	0	180	0	0	0	0	0	280	1	6	10,542	15	6	1,065	9	0	7,039	3	6	3,181	2	3
20	0	0	160	0	0	41	12	3	224	13	3	18,432	4	3	3,251	12	0	12,001	6	0	6,782	5	3
203	0	0	139	3	0	0	0	0	63	0	0	18,636	9	0	2,103	14	9	9,750	5	0	9,497	2	0
0	0	0	52	0	0	0	0	0	0	0	0	11,646	7	3	2,149	5	3	0	0	0	15,791	1	3
259	10	0	308	3	0	0	0	0	0	0	0	71,919	9	6	10,236	10	6	45,891	13	9	3,502	13	6
70	4	0	231	0	0	0	0	0	170	1	3	24,605	8	3	4,148	1	6	16,954	9	3	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	416	1	6	75	13	9	340	3	9	0	0	0
35	4	0	788	0	0	0	0	0	0	0	0	56,487	0	9	9,885	4	0	40,691	7	0	5,910	5	9
0	0	0	4	6	0	0	0	0	0	0	0	8,592	11	6	1,096	0	0	6,305	3	0	1,191	8	6
0	0	0	0	0	0	21	0	0	0	0	0	13,338	4	3	1,988	10	0	11,349	10	3	0	0	0
83	8	0	13	0	0	21	0	0	0	0	0	81,825	3	9	12,607	8	9	66,040	13	6	3,176	13	6
95	2	0	0	0	0	156	0	0	0	0	0	42,520	5	9	11,421	14	0	28,718	6	3	2,380	1	6
1,051	15	6	2,826	4	6	350	6	0	1,271	2	6	4,85,010	6	3	81,112	0	9	3,29,965	5	9	73,932	15	9

Return of the Live and Dead Stock in the Circar of Dowlutabad, Soobah Aurungabad.

Stock.	Bullocks.	Cows.	Calves.	He Buffaloes.	She Buffaloes.	Calves.	Sheep.	Goats.	Horses.	Tattoos.	Colts.	Asses.	Fowls.	Ploughs.	Bukkeer.	Carts.	Mhotes.	Sugar Mills.	Oil Mills.	Sugar Boilers.
Number.	51,000	40,207	13,377	1,068	11,795	2,354	36,168	30,793	84	4,448	444	2,362	1,384	10,306	21,360	2,810	5,116	196	418	220

Return of principal Vegetable produce, its value, and quantity of land cultivated in the Circar of Dowlutabad, Soobah Aurungabad.

Produce.	Quantity of Land.		Quantity of Produce.			Value of Produce.		
	Beeghas.	Pands.	Pullas.	M.	S.	Rs.	A.	P.
Sugar Cane, - - -	2357	2½	2609	0	0	38555	3	5
Wheat, - - - - -	89094	15	32008	0	30	226230	0	0
Bajree, - - - -	197923	18	59772	2	20	287996	0	0
Jowaree, - - -	142069	18½	40997	0	0	189272	0	0
Opium, - - - - -	936	12¼	11	2	1¾	8621	0	0
Ooreed, - - - - -	2033	12	892	1	10	3563	0	0
Gram, - - - -	40139	15	13798	1	3	94130	0	0
Tour, - - - - -	19113	13	5009	1	10	23672	0	0
Tillee, - - - -	5503	7½	1291	0	10	6385	0	0
Kuldee, - - -	18648	14½	6602	0	24	22294	0	0
Rice, uncleaned, - -	4149	9	2160	1	5	10044	0	0
Peas, country, - -	394	13	159	2	20	633	0	0
Tobacco, - - - - -	2122	19	564	1	30	6236	0	0
Moong, - - - - -	3218	16	1056	0	20	3764	0	0
Hemp, - - - - -	3457	0	1045	2	20	7045	0	0
Karleh, - - - - -	816	10	166	1	20	501	0	0
Mukkai, - - - -	150	10	51	0	0	76	0	0
Fruits, - - - - -	324	1	269	0	0	2502	0	0
Vegetables, - - -	481	0	0	0	0	1707	0	0
Cotton, uncleaned, - -	527	13	213	0	20	1284	0	0
Turmeric, - - -	49	12	30	2	0	413	0	0
Koolthee, - - - -	822	16¼	38	0	0	48	4	0
Chillies, - - - -	50	0	15	0	0	120	0	0
Indigo, - - - - -	13	5	1	0	39	98	12	0
Dill Seed, - - - -	220	0	40	0	0	140	0	0
Ralla, - - - - -	3	0	3	0	0	6	0	0
Linseed, - - - -	100	0	20	0	0	60	0	0
Betel Leaves, - - -	35	0	0	0	0	254	0	0
Ground Nut, - - -	50	0	38	1	20	133	8	0
Total...	534807	12½	0	0	0	935791	15	6

Return of the Population of the Circar of Dowlutabad, Soobah Arungabad.

Hindoos.	Amount.	Mahomedans.	Amount.
Brahmin, - - - - - -	3,065	Shaik, - - - - - -	3,831
Purdaisee, - - - - -	1,439	Syed, - - - - - -	552
Bunniah, - - - - - -	1,778	Moghul, - - - - - -	112
Byragee and Gosai, - -	580	Pathan, - - - - -	1,023
Bhat, - - - - - -	75		
Kanarra, - - - - -	88		
Hulwai, - - - - - -	79		
Coonbee, - - - - -	25,675		
Mallee, - - - - - -	142		
Bhatia, - - - - - -	130		
Goorow, - - - - - -	65		
Durzee, - - - - - -	449		
Jungum, - - - - - -	13		
Kussar, - - - - - -	183		
Sonar, - - - - - -	674		
Lohar, - - - - -	300		
Burrhue, - - - - - -	487		
Koomhar, - - - - -	447		
Dhungur, - - - - -	1,344		
Rungriz, - - - - -	92		
Kostee, - - - - - -	407		
Sallee, - - - - - -	138		
Kullal, - - - - - -	84		
Thumbolee, - - - - -	27		
Bunjara, - - - - - -	45		
Kolee, - - - - - -	238		
Josee, - - - - - -	6		
Hujjam, - - - - -	526		
Bhoee, - - - - - -	102		
Mullaure, - - - - -	19		
Manbhow, - - - - -	21		
Turmullee, - - - - -	4		
Baildar, - - - - - -	7		
Tailee, - - - - - -	836		
Dhobee, - - - - - -	322		
Lohnarra, - - - - -	2		
Wattara, - - - - - -	4		
Tuckarra, - - - - -	20		
Jeengur, - - - - - -	17		
Burrood, - - - - -	34		
Kussai, - - - - - -	23		
Putwai, - - - - -	4		
Bhamta, - - - - - -	4		
Kykaree, - - - - -	7		
Bheel, - - - - - -	389		
Dohur, - - - - - -	42		
Chumar, - - - - - -	876		
Dhair or Mhar, - - -	4,445		
Mang, - - - - - -	936		
Total..	46,690		

Return of average prices of Grain from 1842 *to* 1848 *inclusive in the Circar of Dowlutabad, Soobah Aurungabad.*

Grain.	1842.			1843.			1844.			1845.			1846.			1847.			1848.			
Goor,..........	10	13	3	10	10	9	12	5	1	13	13	10	15	2	0	14	0	0	13	0	0	Per pulla
Wheat,...........	2	9	8	2	15	3	3	4	8	4	12	4	7	0	5	4	8	0	2	12	0	
Bajree,...........	2	1	3	2	3	9	2	8	9	3	8	5	4	9	10	3	0	0	2	4	0	
Jowaree,.........	1	7	5	2	0	7	2	3	11	3	4	10	4	3	7	3	0	0	2	2	0	
Opium,...........	4	9	8	4	12	0	5	4	0	5	6	2	6	2	6	5	0	0	4	12	0	Per seer.
Ooreed,...........	2	5	11	2	9	8	2	14	0	3	2	4	4	2	3	3	0	0	3	0	0	Per pulla
Gram,............	2	8	5	2	13	0	3	3	4	4	4	4	6	11	7	5	0	0	3	0	0	
Tour,.......... ..	2	3	8	2	7	4	2	13	6	3	12	2	5	1	7	4	0	0	2	0	0	
Tillee,............	3	3	5	3	7	9	3	11	7	4	6	6	5	12	2	5	0	0	4	8	0	
Kuldee,..........	1	12	5	1	15	10	2	5	4	2	12	5	3	5	8	3	8	0	3	0	0	
Rice, uncleaned,..	3	5	0	3	4	0	3	8	10	4	1	7	4	10	9	4	0	0	3	12	0	
Peas, country,....	2	3	10	2	4	8	2	7	7	2	13	8	4	3	8	3	0	0	2	8	0	
Tobacco,........	6	5	9	7	0	0	7	12	7	8	11	10	9	2	10	8	0	0	8	0	0	
Moong,...........	2	7	10	2	11	10	3	1	5	3	10	0	4	7	3	3	0	0	3	0	0	
Hemp,............	4	6	1	4	8	3	4	13	0	5	7	8	6	3	9	4	0	0	3	8	0	
Karleh,...........	1	11	2	1	14	9	1	15	0	2	2	9	3	0	8	2	0	0	2	0	0	
Mukkai,..........	1	2	0	1	2	7	1	2	7	1	2	7	1	8	0	1	0	0	1	2	0	
Fruits, &c........	3	8	0	3	10	8	4	2	8	4	4	0	4	0	0	3	0	0	3	0	0	
Vegetables,.......	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	No fixed
Cotton, uncleaned,	9	4	8	10	13	1	12	4	8	11	8	0	8	10	8	7	0	0	6	0	0	rate.
Turmeric,........	8	5	4	9	5	4	10	0	0	13	10	8	14	8	0	12	0	0	11	8	0	
Koolthee,.........	1	8	0	1	8	0	1	2	6	1	6	0	1	8	0	1	6	0	1	4	0	
Chillies,..........	7	8	0	8	0	0	6	12	0	6	8	0	8	0	0	10	0	0	9	0	0	
Indigo,...........	2	8	0	2	0	0	2	0	0	1	8	0	1	4	0	2	0	0	1	12	0	Per seer.
Dill Seed....... ..	2	12	0	3	0	0	3	4	0	3	8	0	3	8	0	3	0	0	2	12	0	Per pulla
Ralla,.............	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	2	0	0	2	0	0	
Linseed,..........	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0	3	0	0	3	0	0	[rate.
Betel Leaves,.....	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	No fixed
Ground Nut,.....	3	0	5	3	0	5	3	0	11	3	8	0	5	0	0	4	0	0	3	8	0	Per pulla

Return of the annual consumption of Iron and Salt in the Circar.

Designation.	Average value by weight.	From whence brought.	Quantity.			Value.			Remarks.
Iron.			Pullas.	M.	S.	Rups.	A.	P.	
Europe, 1st quality,...	3 seers per Rupee	Bombay and Nirmul.	44	1	17	1762	13	8	
Europe, 2d quality,...	7 do.		381	0	$19\frac{3}{4}$	6666	13	10	
Native,......	4 do.		178	0	$34\frac{1}{2}$	5309	10	0	
Total...	....	....	603	2	$31\frac{1}{4}$	13739	5	6	
Salt,......	8 Rupees per Pullah.	Bombay and Bhewndy	11607	1	23	92860	3	2	Computed at $\frac{3}{4}$ seers per head.

Return of the state of Education in the Circar.

Schools.			
Persian.	Mahratta.	Number of Pupils.	Persons able to Read and Write.
5	56	813	3,627

Return of the principal Diseases and Deaths in the Circar of Dowlutabad, Soobah Aurungabad.

Leprosy of Joints.	Leprosy of Skin.	Elephantiasis.	Guinea Worm.	Stone in the Bladder.	Blind.	Idiot.	Mad.	Lame.	Deaf.	Small Pox.	Cholera.	Fever.	Other Diseases.	Total.
115	69	53	96	7	415	5	32	30	23	1028	2547	591	1805	5971

Return of Seebundees and Sepahis employed in the Circar.

	Suwars.	Foot.
Sebundees and Sepahis.	46	872

Meteorological Table for 1847, *taken at Aurungabad.*

	Sun-rise.	9 A. M.	3 P. M.	6 P. M.	9 P. M.	Winds.	Rain.	Diurnal Range.
	°	°	°	°	°			°
January, - -	57	69	79	75	70	E.S.E.	0·600	22
February, - -	46	67	86	72	62	N.E.	0·000	40
March, - -	68	80	89	82	80	N.E.	0·000	21
April, - -	78	87	97	87	86	N.E.N.	0·120	19
May, - - -	83	91	91	95	90	N.E.N.	5·690	16
June, - -	77	80	85	87	79	S.W.N.W.	7·850	10
July, - - -	75	78	85	83	77	N.W.	6·780	10
August, - -	73	76	83	80	75	N.W.	2·390	10
September, - -	72	75	79	75	72	N.W.	18·310	7
October, - -	69	79	85	80	79	NNE.NW	1·000	16
November, - -	62	70	77	76	70	N.E. S.E.	1·860	15
December, -	55	74	78	77	73	S.E. N.E.	0·000	23
Mean, - - -	67	77	85	80	76		44·000	

Mean annual Temperature 77°.

W. H. BRADLEY, Surgeon,
8th Regiment Nizam's Infantry,
on Special Duty.

BOLDANAH,
8th September, 1848.

THE IRISH EMIGRANT.

1

I'm sitting by the stile Mary,
  Where we sat side by side,
On a bright May morning long ago,
  Where first you were my bride.
The corn was springing fresh and green,
  And the lark sang loud and high;
And the red was on your lip Mary,
  And the love-light in your eye.

2

The place is little changed Mary,
  The day is bright as then;
The Lark's loud song is in the air,
  And the corn is green again;
But I miss the soft clasp of your hand,
  And your breath warm on my cheek;
And I still keep listening for the words,
  You never more may speak.

3

'Tis but a step down yonder lane,
  And the little church stands near;
The church where we were wed Mary,
  I see the spire from here.
But the grave-yard lies between Mary,
  And my step might break your rest;
For I've laid you, darling, down to sleep,
  With your baby on your breast.

4

I'm bidding you a long farewell,
  My Mary kind and true;
But I'll not forget you, darling,
  In the land I'm going to;
They say there's bread and work for all,
  And the sun shines always there;
But I'll not forget old Ireland
  Were it fifty times as fair.

5

And often in those grand old woods,
  I'll sit and shut my eyes;
And my heart will travel back again
  To the spot where Mary lies;
And I'll think I see the little stile,
  Where we sat side by side;
And the springing corn, and the bright May morn,
  Where first you were my bride.

LADY DUFFERIN.

IDEM LATINE REDDITUM.

1

Sede moror, Marie, quâ nos consedimus olim,
Gaudentes dulci proximitate frui.
Ver erat; et Maii ridebat mensis amœni
Mane novum, atque aderas tu nova nupta mihi.
Surgebant in agris segetes, atque arva virebant;
Aere fundebat dulcis alauda melos.
Et Marie's roseo fulgebant labra colore,
Conscius inque oculis irradiabat amor.

2

Non facies mutata loci, vernœque diei
Clarus adhuc idem splendor adornat agros.
Aere et argutas deducit alauda querelas,
Et viridis passim contegit arva seges.
Sed mihi non dextram teneræ conjungere dextræ,
Nec licet amplexus rursus inire tuos.
Incassum videor blandas audire loquelas,
Verbaque non iterum voce cienda tuâ.

3

Haud procul hinc angusta viam quâ semita ducit,
Exigui fani limina sacra patent.
Connubii ritus nostri celebratus in illis
Œdibus; hinc spirœ est aspiciendus apex.
Ast jacet interea spatium lugubre sepulcri,
Nec requiam gressu fas violare tuam.
Namque ibi te posui longo requiescere somno,
Maternoque jacet nata tenella sinu.

4

Longum dico vale, Marie, fidissima conjux,
Longinquas oras expetiturus eo.
Sed tellure novâ, mea quo vestigia tendo,
Non cadet ex animo dulcis imago tui.
Illic larga Ceres, et præmia justa labori,
Nec latet obscurâ condita nube dies.
Littora sed patriæ non obliviscar Iernæ,
Sint aliena magis conspicienda licet.

5

Atque pererrantem sylvas me sæpe juvabit
Fessum gramineo ponere membra toro;
Et clausis oculis, videar repetisse sepulcrum,
Quâ, Marie, cineres contegit urna tuos,
Et sedem spectare, ubi nos consedimus olim,
Gaudentes dulci proximitate frui,
Et virides segetes, et Maii mensis amœni
Mane novum, quum aderas tu nova nupta mihi.

A. J. A.

VI. *Remarks on the Abstract Tables showing the number of Native Soldiers discharged from the Madras Army, during the five years from* 1842-3 *to* 1846-7 *inclusive. By Assistant Surgeon* Edward Balfour, *of the Right Honorable the Governor's Body Guard.*

In the five years from September, 1842, to August, 1847, inclusive; 2,149 of the Madras Native Army were discharged the service. A cursory examination of the causes which led to their discharge shows that crime, disease, and natural physical unfitness were the chief agencies in operation: we cannot, however, ascertain the exact share that each of these causes had, for, of the 2,419 individuals who have been in this manner removed from the strength of the Army, of 1,077, or nearly the half of them, no mention was made, in the monthly discharge rolls, of the crime or cause which had led to their dismissal. Had this omission not occurred the records would have furnished a sufficient number of facts to admit of many more practical deductions than they now allow; but, even as they are, they supply information of a nature calculated to assist us in the selection of recruits, the repression of crime, and the internal economy of the Army.

Although dismissal or discharge from the service is more frequently had recourse to in the Native Army of India than amongst H. M. soldiers, the military code admits of several other punishments. The Articles of War in force, when these rolls of discharged men were for the first time published, were promulgated in the year 1827, and contained 82 articles, 43 of which specified crimes punishable by Military Courts, and the punishments which the latter could award. These punishments were death; corporal punishment; stoppage of pay and allowances; fines; dismissal; reduction; and forfeiture of pension. This code continued in force until 1845, but it was greatly altered by the Governor General's order of the 24th February, 1835, by which corporal punishment in the Native armies was prohibited, and discharge from the service substituted for it; and it was still further altered by the penal act of 1839, sanctioning, along with their discharge from the service, imprisonment, with or without hard labor.

In this code, of 1827, there were 15 articles specifying crimes for which Military Courts could award sentence of death, but, as the

chief punishment before 1835 was flogging, so discharge from the service and imprisonment with hard labor, was the usual sentence after 1839.

On these articles being annulled by Act XX. 7th October, 1845, the code, then, substituted, contained 154 articles, 91 of which related to crimes and their punishments; and the abolition of corporal punishment having been found to work very unsatisfactorily, it was, by this act, again introduced, but so greatly restricted that, even, a General Court Martial could only award 200 lashes, and these, only, for certain offences. Imprisonment with hard labor, which had become so common since 1839, was greatly restricted by this act, it being permitted to be awarded only for the most disgraceful crimes.

In 19 articles, death, or other punishment, could be awarded, the remaining articles admitting of imprisonment, simple or solitary, and with or without hard labor, and discharge.

The provisions in the Articles of War of Act XX.7th October,1845, may be said to be still in force, but, amended by the Act of 1st March, 1848, promulgating a new code, in which the principal alterations made, consisted in conferring increased power on commanding officers of regiments; making some articles more comprehensive; specifying some offences with more minuteness; changing, slightly, the mode of applying punishment, and providing for three crimes, viz.: striking or forcing a sentry; refusing to labor on field works, and a sentry plundering property under his charge; which were not detailed in former codes.

The code of 1st March, 1848, contains 158 articles, 96 of which specify crimes and their punishments, and, like that of 1845, by 19 of its articles, Military Courts can award the punishment of death. Corporal punishment may still be awarded, but it is, now, restricted to 50 lashes, and it is understood to be the wish of Government that it be awarded, only, for certain offences, viz.: mutiny; violence to superiors; insubordination; drunkenness on duty, and disgraceful conduct; and even, for such offences, to be as seldom as possible carried into effect.

In order to understand the frequency of dismissal and discharge in the Indian Army, it must also be mentioned that it has always been in the power of the Governor in Council and Commander-in-Chief,

to substitute dismissal from the service for the punishments which Courts Martial award. So that there are three modes by which men are removed from the service for crimes; some soldiers being discharged by sentence of Courts Martial; some, in consequence of having been sentenced by the Courts Martial, or by the Civil Courts of the country, to punishments, which, from their degrading nature, rendered those on whom they were inflicted, unworthy of remaining longer amongst soldiers; and some discharges are the punishments substituted or commuted by the superior authorities for those awarded by the Military Courts.

As the benefits and rewards of service should be commensurate with its punishments, to allow the latter to exert their fullest influence, and with the view of exhibiting the extent of the punishment inflicted by discharging a soldier, it may be mentioned that the pay of the Native Armies of India, particularly those of Bengal and Bombay, is greatly above the amount earned by their relatives or others of their own class of society, employed in the occupations of civil life. This is the case, even, when the soldier first enlists, and his pay is afterwards, at stated periods, increased. Besides this, every private soldier may obtain a commission, the Native officers of the regular army, Jemadars and Subadars, rising, exclusively, from the ranks. They also receive medals, when decreed to the army, and they are admitted into two military orders, viz.: the Order of Merit, with the title of Bāhādoor, into which the private equally with the commissioned officer may be admitted; and the Order of British India, with the title of Sirdar Bāhādoor, for Native officers of distinguished services. It will be observed from this that discharge from the service is a severe punishment and in this light the Native soldiers regard it.

The code of 1845, and that of 1848, are, both, more minute in their specification of crime, than the code of 1827; but from the nature of military service, and the closeness of the links in the chain of discipline, a soldier, committing himself, generally infringes more than one article, and when attempting, therefore, to classify the offences which led to the discharge of these 2,419 Madras Native soldiers, the graver crime has been the guide to the arrangement, as it doubtless had been to the sentence of the Court Martial.

It will be seen from the table that of the 91 articles providing for

crimes, in the code of the 7th October,1845, it is only on 20 of them, or less than the fourth part, that the discharges have been awarded, viz. :

Mutiny,
Violence to superiors,
Disobedience of lawful command,
Desertion,
Drunkenness on duty,
Gross insubordination in the ranks, &c.
Breach of arrest or confinement,
False statement, &c. to obtain pension,
Malingering,
Selling or injuring Arms,
Embezzlement,
Disgraceful conduct,
Quitting or sleeping on post in time of peace,
Accepting bribes to procure leave, &c.
Quitting guard or picquet in time of peace,
Absence from parade,
Absence without leave or overstaying leave,
Absence from cantonment after hours,
Selling, losing, or wasting ammunition,
Crimes not specified (to the prejudice of good order,) &c. &c.

If it be established by further experience that these twenty classes of crime are of most frequent occurrence, the importance of directing considerable attention to their prevention or repression must be obvious.

Some of the above classes of crime were of more frequent occurrence than others, and it may be useful to allude to them individually : the first of them is

Mutiny. 37 Native soldiers are recorded to have been discharged for mutiny, in the five years, six of whom were Hindoos, and thirty-one Mahomedans ; in this period the average strength of the Madras native army was 44,129,* from which it appears that in the five years the number of discharged mutinous soldiers was, 8·3 in every 10,000 ; being, only, 1·6 per 10,000, annually.

It will be observed from the table that there were none discharged for mutiny in 1842-43 ; 1843-44 ; or in 1845-46 ; but that, of the 37 individuals, 31 were dismissed in 1844-45, and six in 1846-47, and those who combined appear to have been all Hindoos or all Mahomedans.

* See Appendix No. IV. In this strength is included only those soldiers whose names are inserted in the discharged rolls.

From this irregularity of its appearance, it may be inferred that causes of mutiny are either not in constant operation, or the Madras Native soldiers have not a mutinous disposition, but do occasionally band themselves together to obtain some specific object.

The Hindoos discharged for mutiny were on the average 26 years of age and had served 7½ years.

The average age of the Mahomedans was 31 years, and their service 14 years. The mutineers were, therefore, men of full growth, and above the average length of service: all of them, therefore, old soldiers, whose combinations must be regarded as a serious matter.

Violence to Superiors. Only six men are mentioned as having been discharged the service for this offence, 3 Hindoos, and 3 Mahomedans, most of them old soldiers, their average age being 25½ years, and their average service 7½ years.

Disobedience of Lawful Command, led to the discharge of 23 men, 16 of whom were Hindoos, 6 Mahomedans, and only 1 Christian.

The average age of the discharged men was upwards of 25 years, and their service 6 years, 8 months. This crime seems, therefore, to be an offence of the older soldiers.

Desertion. Of the 40 soldiers discharged for deserting, 31 were Hindoos, and nine Mahomedans. This is evidently an offence of very young soldiers, for their average age was only 21 years, and their service two years, and the Hindoos, the less military class of the Madras Presidency, have apparently deserted in somewhat greater numbers than the Mahomedans.

Drunkenness on Duty, has not often occurred, apparently, for only 7 cases of discharge are recorded from it, viz.: 5 Hindoos, 1 Mahomedan, and 1 Christian. This likewise seems to be a vice of the older soldiers, for the age of the offenders was, on the average 25 years, 5 months, and their average service six years, and one month.

Only one man was discharged for gross insubordination in the ranks, and two for breach of arrest.

False Statement or Certificate to obtain Pension, is a crime for which ten men are recorded to have been discharged. Their average age was twenty-four years and a half.

Malingering, led to the discharge of 13 men, 7 Hindoos and 6

Mahomedans, all of them of the older soldiers, their average age being 26 years, and service 7 years, 8 months.

Three men were discharged for selling or injuring arms, and one for embezzlement.

Disgraceful Conduct, led to the discharge of 127 Native soldiers, of whom 69 were Hindoos, 51 Mahomedans, and 7 Christians. Nearly the whole of this number, viz., 114, had committed theft; had robbed, or been found with stolen property in their possession. If we assume 28½ years, to be the average age, and 10 years the average service of the Madras Native army,* it would appear to be among the younger soldiers, that disgraceful conduct occurs, for the average age of all those discharged was 24 years, and their service five years.

Quitting or Sleeping on post in time of Peace, led to the discharge of 18 soldiers. All of them young men, their average age being 23 years 10 months, and service 5½ years.

Only 2 men accepted bribes and were discharged; 3 who quitted their guards, and 5 for absence from parade.

For Absence without Leave or Overstaying Leave, 42 discharges are mentioned, 23 Hindoos and 19 Mahomedans. Young men apparently commit these offences, for those discharged were on the average 23 years of age, and had served only 4 years and 8 months.

Only two discharges are mentioned under the head of absence from cantonment after hours, both of them being young Hindoo soldiers, and one Christian, of eight years' service, was discharged for wasting ammunition.

Crimes not specified, but, to the prejudice of good order and Military Discipline, led to the discharge of 320 soldiers, 151 of whom were Hindoos, 130 Mahomedans and 39 Christians. There are 80 offences enumerated as having been committed by these 320 soldiers, but the most frequent were insubordinate conduct for which 32 were dismissed; drunkenness, 55; incorrigible bad character, 90; and discovered to have been discharged from another regiment previously, 101; total 278, or six-sevenths of the whole of this class of crime. Only the younger soldiers appear to commit themselves in this manner, for the average age of all dismissed was only 22 years, 8 months, with 3 years and 10 months service.

* See Appendix No. II.

Physical Causes, have occasioned the discharge of 569 soldiers, of whom 327 were Hindoos, 172 Mahomedans, and 70 Christians. Part of these numbers had evidently, however, been discharged for diseases, which, from their nature, must have appeared in the course of the soldiers' service, and part of them, on account of constitutional defects, existing naturally in their constitution at the time of enlistment.

It will be useful, therefore, to examine the men discharged for Physical Causes, under these two heads :

I. *Number discharged on account of Disease.*

	215 Hindoos.		103 Mahomedans.		20 Christians.		338 Total.	
	Yrs.	Ms.	Yrs.	Ms.	Yrs.	Ms.	Yrs.	Ms.
Whose average age at date of discharge, - - -	23	4	22	6	20	9	22	11
Whose average service at date of discharge, - -	4	6	4	2	4	2	4	5
*** Whose average age when entertained, - - -	18	10	18	4	16	7	18	6

The average age of all discharged for disease was about 23 years, and after 4½ years' service.

II. *Number discharged on account of Physical Defects.*

	112 Hindoos.		69 Mahomedans.		50 Christians.		231 Total.	
	Yrs.	Ms.	Yrs.	Ms.	Yrs.	Ms.	Yrs.	Ms.
Whose average age at date of discharge, - - -	19	7	19	8	17	11	19	2
Whose average service at date of discharge, - - -	1	10	1	11	1	10	1	10
*** Whose average age when enlisted, - - - -	17	9	17	9	16	1	17	4

The greater number of the Christians were discharged from inability to learn music, but the Hindoos and Mahomedans were mostly discharged for imbecility, constitutional debility, and incapacity to

learn their drill. It will be observed that the soldiers discharged for these causes, were, only, 19 years of age, on the average, and had served only 1 year and 10 months.

The cause of the discharge of 1,077 soldiers, is not detailed. The omission is to be regretted, as it prevents us determining the exact numbers discharged for each crime, &c., but they seem to have been enlisted and again discharged at a like youthful age to that of the men, whose crimes and physical ailments are recorded.

Of the 1,077 thus discharged, viz.:

	579 Hindoos.		454 Mahomedans.		44 Christians.		1077 Total.	
	Yrs.	Ms.	Yrs.	Ms.	Yrs.	Ms.	Yrs.	Ms.
Their average age at date of discharge, - - - -	23	10	24	0	24	3	23	11
Their average service at date of discharge, - - -	5	3	5	7	6	2	5	5
*** Their average age when enlisted, - - - -	18	7	18	5	18	1	18	6

these 1,077 soldiers were discharged before they were 24 years of age, after, only, 5½ years' service.

Only 110 soldiers, in five years, or five in ten thousand annually, received their discharge at their own request. They had served 5½ years, and were 24 years of age, on the average, at the date of their discharge.

Altogether 663 soldiers are recorded to have been discharged for crimes, viz.:

	337 Hindoos.		271 Mahomedans.		55 Christians.		663 Total.	
	Yrs.	Ms.	Yrs.	Ms.	Yrs.	Ms.	Yrs.	Ms.
Whose average age at date of discharge, - - - -	23	0	24	1	23	4	23	7
Whose average service at date of discharge, - - -	4	5	5	6	4	6	4	10
*** Their average age when enlisted, - - - -	18	7	18	7	18	10	18	9

It would, however, appear from these tables that some offences

are committed by the older men, and others, almost exclusively, by the younger part of the army.

Offences of the older Soldiers.

	Number Discharged.	Total. Ages. Ys.	Ms.	Services Ys.	Ms.
Mutiny, - - -	37	1118	0	479	4
Violence to superiors,	6	153	0	46	2
Disobedience of lawful command, - -	23	580	0	154	10
Drunkenness on duty	7	178	0	43	0
Gross insubordination in the ranks, or before a Court Martial, - - - -	1	26	0	8	8
Breach of arrest, or confinement, - -	2	56	0	21	3
Malingering, -	13	340	0	100	1
Wasting ammunition,	1	25	0	8	3
Total..	90	2476	0	861	7
Average..	0	27	6	9	6

Offences of the younger Soldiers.

	Number Discharged.	Total. Ages. Ys.	Ms.	Services Ys.	Ms.
Desertion, - -	40	844	0	81	4
False statement to obtain pension, -	10	246	0	43	2
Selling Arms, -	3	63	0	10	0
Embezzlement, -	1	23	0	2	10
Disgraceful conduct,	127	3068	0	668	10
Quitting or sleeping on post, &c. - -	18	430	0	101	5
Accepting bribes, -	2	48	0	9	7
Quitting guard or picquet in peace, -	3	80	0	22	7
Absence without leave, - - -	42	974	0	197	5
Absence from parade,	5	118	0	18	2
Absence from cantonment after hours,	2	43	0	9	0
Crimes to the prejudice of good order, &c. - - - -	320	7273	6	1227	1
Total..	573	13,210	6	2391	5
Average..	0	23	0	4	2

It would appear from this that the more grave military crimes are committed by the older soldiers, but that few of them do actually commit themselves, the number of them discharged being only 90 out of 663, or a seventh part of the whole of those dismissed for crimes.

The average age and service of all the 2,419 discharged men was as follows:

	1298 Hindoos. Yrs.	Ms.	942 Mahomedans. Yrs.	Ms.	179 Christians. Yrs.	Ms.	2419 Total. Yrs.	Ms.
Whose average age at date of discharge, - - - - -	23	4	23	6	21	9	23	3
Whose average service at date of discharge, - - -	4	7	5	1	4	4	4	9
*** Whose average age when entertained, - - - -	18	9	18	5	17	5	18	6

The average age of all the discharged men was only 23 years and 3 months, and their average service 4 years and 9 months; they had, therefore, been enlisted when only 18 years and 6 months old.

Military commanders, and Medical officers of armies have repeatedly objected to the entertainment of too young soldiers, and, in recent times, none have more strongly pointed out the inefficiency of this kind of troops, and the great value of old soldiers, than the Emperor Napoleon, and, His Grace the Duke of Wellington; and the same is strongly insisted on in the writings of M.M. Coche, Kirckhoff, and Inspector General Marshall. The chief objection which has hitherto been offered, however, has been the physical inability of young men to undergo the fatigues of field service, but we observe, from these tables, that there are grave objections to their enlistment, in a moral point of view; for, in the 5 years from 1842-43 to 1846-47, while 569 were discharged for disease and physical unfitness, whose average age was 21 years and 5 months, and their service 3 years and 4 months, 663 men were discharged for crimes, whose ages, only, average 23 years and 7 months, and their service 4 years and 10 months.

The diseased and physically unfit men, had been entertained when 18 years of age, and were discharged again at the age of 21: but the soldiers have been discharged for crimes at a somewhat later period of life, having been enlisted when 18 years and 9 months old, on the average, and discharged at the age of 23 years and 7 months, a difference of age at the time of their discharge of 2½ years.

The ages at which the greatest tendency to crime, and to disease occur amongst the native soldiers, may, however, be nearer each other than this, for, while sickly men come immediately under notice, (and the result of sickness being, generally, calculable, diseased or broken men are at once got rid of) moral sickness, *i. e.* the vices and crimes of young men being considered more obscure, a young soldier's first offences are gently dealt with, and his discharge is effected, only, after repeated admonitions and severer punishments have failed. And, therefore, although 21 years be the average age at which the native soldiers have been discharged for sickness, and

23 years the average age of those discharged for crimes, there may, probably, be a closer connection between mental and bodily sickness than these 2 years of difference would evince.

As the greater part of the crimes seem to have been committed by younger soldiers, and their crimes being of a nature which the thoughtlessness and excitability of youth, and their weakness in resisting temptation would lead them to commit, it might be a question, whether it would not be useful to keep the younger soldiers more constantly employed and thereby exhaust that nervous energy, the superabundance of which thrusts them into errors—to order, for instance, all soldiers under 5 years' service, to more frequent exercises than those above it.

But as the whole of the 2,419 soldiers had been entertained when only 18 years and 6 months old, and were discharged before the age of 24, there need be no hesitation in asserting that the greater number of them were enlisted and again discharged before ever they were physically fit for the fatigues of field service.

EDWARD BALFOUR,
Assistant Surgeon.

MADRAS, 1849.

For the 5 Years 1842-3, to 1846-7 inclusive.

ABSTRACT TABLE NO. I. *Showing the number of Hindoos, Mahomedans and Christians of the Madras Native Army annually discharged the Service.*

CAUSES OF DISCHARGE.	1842-1843.				1843-1844.				1844-1845.				1845-1846.				1846-1847.				Total number in the 5 years from 1st September, 1842, to 31st August, 1847.			
	Hindoos.	Mahomedans.	Christians.	Total.	Hindoos.	Mahomedans.	Christians.	Total.	Hindoos.	Mahomedans.	Christians.	Total.	Hindoos.	Mahomedans.	Christians.	Total.	Hindoos.	Mahomedans.	Christians.	Total.	Hindoos.	Mahomedans.	Christians.	Total.
Mutiny,	0	0	0	0	0	0	0	0	4	27	0	31	0	0	0	0	2	4	0	6	6	31	0	37
Violence to Superiors,	1	0	0	1	0	0	0	0	1	0	0	1	0	1	0	1	1	2	0	3	3	3	0	6
Disobedience of Lawful Command,	2	2	0	4	3	1	0	4	1	2	0	3	5	0	1	6	5	1	0	6	16	6	1	23
Desertion,	13	3	0	16	10	1	0	11	0	2	0	2	1	1	0	2	7	2	0	9	31	9	0	40
Drunkenness on Duty,	1	1	0	2	1	0	0	1	0	0	0	0	0	0	0	0	3	0	1	4	5	1	1	7
Gross insubordination in the Ranks or before a Court Martial,	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0	1	0	1
Breach of Arrest or Confinement,	1	0	0	1	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	1	0	1	2
False Statement or Certificate to obtain Pension,	0	0	1	1	2	1	0	3	0	0	0	0	0	0	0	0	4	2	0	6	6	3	1	10
Malingering,	1	0	0	1	3	2	0	5	0	2	0	2	2	1	0	3	1	1	0	2	7	6	0	13
Selling or injuring Arms, &c.	0	0	0	0	0	0	0	0	0	1	0	1	1	0	0	1	0	0	1	1	1	1	1	3
Embezzlement,	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	1	0	0	1
Disgraceful Conduct,	16	11	1	28	11	7	0	18	5	6	2	13	11	12	2	25	26	15	2	43	69	51	7	127
Quitting or sleeping on post in time of Peace,	2	0	0	2	2	0	0	2	1	0	0	1	3	2	0	5	3	4	1	8	11	6	1	18
Accepting Bribes to procure Leave, Promotion, &c.	1	0	0	1	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	1	1	0	2
Quitting Guard or Picquet in time of Peace,	0	1	0	1	0	0	0	0	0	0	0	0	1	0	0	1	1	0	0	1	2	1	0	3
Absence from Parade,	1	0	1	2	0	0	0	0	0	0	0	0	0	1	1	2	0	1	0	1	1	2	2	5
Absence without Leave or Overstaying Leave,	7	1	0	8	1	2	0	3	2	0	0	2	4	6	0	10	9	10	0	19	23	19	0	42
Absence from Cantonment after hours,	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	2	2	0	0	2
Wasting Ammunition, &c.	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1
Crimes not specified (to the prejudice of good order,) &c.	38	20	9	67	25	28	4	57	29	30	10	69	24	23	6	53	35	29	10	74	151	130	39	320
Disease,	73	42	5	120	30	12	1	43	31	12	2	45	45	17	7	69	36	20	5	61	215	103	20	338
Physical unfitness,	40	18	7	65	23	15	4	42	23	14	13	50	13	7	11	31	13	15	15	43	112	69	50	231
At his own request,	20	9	2	31	4	7	2	13	8	9	1	18	9	9	4	22	14	11	1	26	55	45	10	110
Crime or other cause of discharge not detailed,	103	92	6	201	160	140	12	312	174	130	10	314	62	38	9	109	80	54	7	141	579	454	44	1077
Total......	320	200	33	553	275	216	23	514	279	236	38	553	181	119	42	342	243	171	43	457	1298	942	179	2419

E. B.

ABSTRACT TABLE No. II. *Constructed from the Monthly Discharge Rolls, of the Madras Native Army, showing the average Age, and average Service of all the Soldiers who were discharged, and the nature of the crimes or other causes which led to their discharge.*

1842-1843. Total Number of Years of Age and Years of Service.

CAUSES OF DISCHARGE.	Hindoos Age Years	Hindoos Age Months	Hindoos Service Years	Hindoos Service Months	Mahomedans Age Years	Mahomedans Age Months	Mahomedans Service Years	Mahomedans Service Months	Christians Age Years	Christians Age Months	Christians Service Years	Christians Service Months	Total Age Years	Total Age Months	Total Service Years	Total Service Months
Mutiny	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Violence to Superiors	21	0	4	1	0	0	0	0	0	0	0	0	21	0	4	1
Disobedience of Lawful Command	43	0	3	4	45	0	9	8	0	0	0	0	88	0	13	0
Desertion	267	0	20	9	64	0	8	9	0	0	0	0	331	0	29	6
Drunkenness on Duty	26	0	6	10	21	0	3	1	0	0	0	0	47	0	9	11
Gross insubordination in the Ranks or before a Court Martial	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Breach of Arrest or Confinement	20	0	1	11	0	0	0	0	0	0	0	0	20	0	1	11
False Statement or Certificate to obtain Pension	0	0	0	0	0	0	0	0	33	0	4	9	33	0	4	9
Malingering	22	0	4	3	0	0	0	0	0	0	0	0	22	0	4	3
Selling or injuring Arms, &c.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Embezzlement	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Disgraceful Conduct	370	0	67	4	257	0	40	4	27	0	12	0	654	0	119	8
Quitting or Sleeping on post in time of Peace	53	0	13	2	0	0	0	0	0	0	0	0	53	0	13	2
Accepting Bribes to procure Leave, Promotion, &c.	23	0	3	10	0	0	0	0	0	0	0	0	23	0	3	10
Quitting Guard or Picquet in time of Peace	0	0	0	0	22	0	2	7	0	0	0	0	22	0	2	7
Absence from Parade	23	0	3	6	0	0	0	0	19	0	0	10	42	0	4	4
Absence without Leave or Overstaying Leave	146	0	17	1	19	0	0	7	0	0	0	0	165	0	17	8
Absence from Cantonment after hours	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Wasting Ammunition, &c.	0	0	0	0	0	0	0	0	25	0	8	3	25	0	8	3
Crimes not specified, (to the prejudice of good order, &c.)	837	0	108	1	441	0	51	2	202	0	26	11	1480	0	186	2
Disease	1633	0	271	9	925	9	141	4	99	6	13	10	2658	3	426	11
Physical unfitness	767	0	44	10	378	0	44	1	133	0	14	8	1278	0	103	7
At his own request	493	0	116	2	207	0	43	5	44	0	13	9	744	0	173	4
Crime or other Cause of discharge not detailed	2300	0	397	4	2168	0	422	9	143	6	33	5	4611	6	853	6
Total	7044	0	1084	3	4547	9	767	9	726	0	128	5	12317	9	1960	5

1843-1844. Total Number of Years of Age and Years of Service.

CAUSES OF DISCHARGE.	Hindoos Age Years	Hindoos Age Months	Hindoos Service Years	Hindoos Service Months	Mahomedans Age Years	Mahomedans Age Months	Mahomedans Service Years	Mahomedans Service Months	Christians Age Years	Christians Age Months	Christians Service Years	Christians Service Months	Total Age Years	Total Age Months	Total Service Years	Total Service Months
Mutiny	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Violence to Superiors	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Disobedience of Lawful Command	76	0	19	0	28	0	11	2	0	0	0	0	104	0	30	2
Desertion	198	0	8	6	25	0	6	11	0	0	0	0	223	0	15	5
Drunkenness on Duty	24	0	4	3	0	0	0	0	0	0	0	0	24	0	4	3
Gross insubordination in the Ranks or before a Court Martial	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Breach of Arrest or Confinement	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
False Statement or Certificate to obtain Pension	48	0	13	8	23	0	5	9	0	0	0	0	71	0	19	5
Malingering	69	0	16	0	57	0	24	3	0	0	0	0	126	0	40	3
Selling or injuring Arms, &c.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Embezzlement	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Disgraceful Conduct	276	0	72	1	167	0	43	10	0	0	0	0	443	0	115	11
Quitting or Sleeping on post in time of Peace	48	0	13	2	0	0	0	0	0	0	0	0	48	0	13	2
Accepting Bribes to procure Leave, Promotion, &c.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Quitting Guard or Picquet in time of Peace	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Absence from Parade	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Absence without Leave or Overstaying Leave	24	0	3	6	49	0	8	4	0	0	0	0	73	0	11	10
Absence from Cantonment after hours	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Wasting Ammunition, &c.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Crimes not specified, (to the prejudice of good order, &c.)	559	0	74	9	597	0	58	6	96	0	24	5	1252	0	157	8
Disease	688	0	138	0	270	0	39	11	22	0	3	6	980	0	181	5
Physical unfitness	433	0	41	7	313	0	27	9	75	0	8	5	821	0	77	9
At his own request	98	0	24	2	155	0	28	4	43	0	4	5	296	0	56	11
Crime or other Cause of discharge not detailed	3899	0	870	1	3274	9	704	8	273	6	55	7	7447	3	1630	4
Total	6440	0	1298	9	4958	9	959	5	509	6	96	4	11908	3	2354	6

1844-1845. Total Number of Years of Age and Years of Service.

CAUSES OF DISCHARGE.	Hindoos Age Years	Hindoos Age Months	Hindoos Service Years	Hindoos Service Months	Mahomedans Age Years	Mahomedans Age Months	Mahomedans Service Years	Mahomedans Service Months	Christians Age Years	Christians Age Months	Christians Service Years	Christians Service Months	Total Age Years	Total Age Months	Total Service Years	Total Service Months
Mutiny	93	0	18	8	837	0	382	11	0	0	0	0	930	0	401	7
Violence to Superiors	24	0	5	7	0	0	0	0	0	0	0	0	24	0	5	7
Disobedience of Lawful Command	21	0	1	2	45	0	8	5	0	0	0	0	66	0	9	7
Desertion	0	0	0	0	38	0	1	8	0	0	0	0	38	0	1	8
Drunkenness on Duty	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Gross insubordination in the Ranks or before a Court Martial	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Breach of Arrest or Confinement	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
False Statement or Certificate to obtain Pension	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Malingering	0	0	0	0	58	0	16	3	0	0	0	0	58	0	16	3
Selling or injuring Arms, &c.	0	0	0	0	19	0	1	8	0	0	0	0	19	0	1	8
Embezzlement	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Disgraceful Conduct	130	0	35	5	126	0	21	11	41	0	5	7	297	0	62	11
Quitting or Sleeping on post in time of Peace	21	0	3	1	0	0	0	0	0	0	0	0	21	0	3	1
Accepting Bribes to procure Leave, Promotion, &c.	0	0	0	0	25	0	5	9	0	0	0	0	25	0	5	9
Quitting Guard or Picquet in time of Peace	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Absence from Parade	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Absence without Leave or Overstaying Leave	43	0	8	7	0	0	0	0	0	0	0	0	43	0	8	7
Absence from Cantonment after hours	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Wasting Ammunition, &c.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Crimes not specified, (to the prejudice of good order, &c.)	628	0	82	6	642	6	80	11	225	0	29	0	1495	6	192	5
Disease	711	0	130	11	256	0	48	7	40	0	10	10	1007	0	190	4
Physical unfitness	493	0	49	1	278	0	23	7	248	0	19	2	1019	0	91	10
At his own request	198	0	49	5	210	0	37	4	26	0	12	4	434	0	99	1
Crime or other Cause of discharge not detailed	4200	8	986	11	3153	8	773	6	247	6	71	9	7601	10	1832	2
Total	6562	8	1371	4	5688	2	1402	6	827	6	148	8	13078	4	2922	6

1845-1846. Total Number of Years of Age and Years of Service.

CAUSES OF DISCHARGE.	Hindoos Age Years	Hindoos Age Months	Hindoos Service Years	Hindoos Service Months	Mahomedans Age Years	Mahomedans Age Months	Mahomedans Service Years	Mahomedans Service Months	Christians Age Years	Christians Age Months	Christians Service Years	Christians Service Months	Total Age Years	Total Age Months	Total Service Years	Total Service Months
Mutiny	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Violence to Superiors	0	0	0	0	33	0	15	7	0	0	0	0	33	0	15	7
Disobedience of Lawful Command	120	0	27	6	0	0	0	0	28	0	8	5	148	0	35	11
Desertion	22	0	0	5	20	0	0	8	0	0	0	0	42	0	1	1
Drunkenness on Duty	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Gross insubordination in the Ranks or before a Court Martial	0	0	0	0	26	0	8	8	0	0	0	0	26	0	8	8
Breach of Arrest or Confinement	0	0	0	0	0	0	0	0	36	0	19	4	36	0	19	4
False Statement or Certificate to obtain Pension	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Malingering	54	0	12	8	35	0	20	1	0	0	0	0	89	0	32	9
Selling or injuring Arms, &c.	23	0	3	11	0	0	0	0	0	0	0	0	23	0	3	11
Embezzlement	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Disgraceful Conduct	264	0	54	2	293	0	78	8	48	0	10	5	605	0	143	3
Quitting or Sleeping on post in time of Peace	69	0	15	10	57	0	17	10	0	0	0	0	126	0	33	8
Accepting Bribes to procure Leave, Promotion, &c.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Quitting Guard or Picquet in time of Peace	24	0	3	9	0	0	0	0	0	0	0	0	24	0	3	9
Absence from Parade	0	0	0	0	26	0	3	8	25	0	2	11	51	0	6	7
Absence without Leave or Overstaying Leave	95	0	23	5	152	0	38	3	0	0	0	0	247	0	61	8
Absence from Cantonment after hours	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Wasting Ammunition, &c.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Crimes not specified, (to the prejudice of good order, &c.)	562	0	90	6	531	0	93	5	155	0	51	2	1248	0	235	1
Disease	1110	0	237	10	395	0	79	8	155	0	39	7	1660	0	357	1
Physical unfitness	232	0	36	8	118	0	10	9	175	0	22	7	525	0	70	0
At his own request	224	0	56	1	211	0	50	0	93	0	16	3	528	0	122	4
Crime or other Cause of discharge not detailed	1440	0	313	11	907	0	243	5	225	0	60	11	2572	0	617	11
Total	4239	0	876	4	2804	0	660	8	940	0	231	7	7983	0	1768	7

1846-1847. Total Number of Years of Age and Years of Service.

CAUSES OF DISCHARGE.	Hindoos Age Years	Hindoos Age Months	Hindoos Service Years	Hindoos Service Months	Mahomedans Age Years	Mahomedans Age Months	Mahomedans Service Years	Mahomedans Service Months	Christians Age Years	Christians Age Months	Christians Service Years	Christians Service Months	Total Age Years	Total Age Months	Total Service Years	Total Service Months
Mutiny	63	0	26	8	125	0	51	1	0	0	0	0	188	0	77	9
Violence to Superiors	26	0	8	10	49	0	12	1	0	0	0	0	75	0	20	11
Disobedience of Lawful Command	151	0	61	0	23	0	5	2	0	0	0	0	174	0	66	2
Desertion	167	0	30	5	43	0	3	3	0	0	0	0	210	0	33	8
Drunkenness on Duty	79	0	20	8	0	0	0	0	28	0	8	2	107	0	28	10
Gross insubordination in the Ranks or before a Court Martial	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Breach of Arrest or Confinement	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
False Statement or Certificate to obtain Pension	90	0	4	1	52	0	14	11	0	0	0	0	142	0	19	0
Malingering	25	0	4	10	20	0	1	9	0	0	0	0	45	0	6	7
Selling or injuring Arms, &c.	0	0	0	0	0	0	0	0	21	0	4	5	21	0	4	5
Embezzlement	23	0	2	10	0	0	0	0	0	0	0	0	23	0	2	10
Disgraceful Conduct	661	0	149	0	364	0	75	5	44	0	2	8	1069	0	227	1
Quitting or Sleeping on post in time of Peace	69	0	18	2	93	0	18	2	20	0	2	0	182	0	38	4
Accepting Bribes to procure Leave, Promotion, &c.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Quitting Guard or Picquet in time of Peace	34	0	16	3	0	0	0	0	0	0	0	0	34	0	16	3
Absence from Parade	0	0	0	0	25	0	7	3	0	0	0	0	25	0	7	3
Absence without Leave or Overstaying Leave	202	0	36	3	244	0	61	5	0	0	0	0	446	0	97	8
Absence from Cantonment after hours	43	0	9	0	0	0	0	0	0	0	0	0	43	0	9	0
Wasting Ammunition, &c.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Crimes not specified, (to the prejudice of good order, &c.)	866	0	213	11	719	0	184	0	213	0	57	10	1798	0	455	9
Disease	878	0	201	7	476	0	123	5	99	0	16	4	1453	0	341	4
Physical unfitness	271	0	34	6	272	0	16	9	267	0	30	5	810	0	81	8
At his own request	352	0	89	3	274	0	73	7	22	0	1	3	648	0	164	1
Crime or other Cause of discharge not detailed	2005	0	490	11	1406	0	395	2	179	0	53	1	3590	0	939	2
Total	6005	0	1418	2	4185	0	1043	5	893	0	176	2	11083	0	2637	9

Aggregate of Ages and Services for the 5 Years from 1st August 1842, to 31st July 1847.

CAUSES OF DISCHARGE.	Hindoos Age Years	Hindoos Age Months	Hindoos Service Years	Hindoos Service Months	Mahomedans Age Years	Mahomedans Age Months	Mahomedans Service Years	Mahomedans Service Months	Christians Age Years	Christians Age Months	Christians Service Years	Christians Service Months	Total Age Years	Total Age Months	Total Service Years	Total Service Months
Mutiny	156	0	45	4	962	0	434	0	0	0	0	0	1118	0	479	4
Violence to Superiors	71	0	18	6	82	0	27	8	0	0	0	0	153	0	46	2
Disobedience of Lawful Command	411	0	112	0	141	0	34	5	28	0	8	5	580	0	154	10
Desertion	654	0	60	1	190	0	21	3	0	0	0	0	844	0	81	4
Drunkenness on Duty	129	0	31	9	21	0	3	1	28	0	8	2	178	0	43	0
Gross insubordination in the Ranks or before a Court Martial	0	0	0	0	26	0	8	8	0	0	0	0	26	0	8	8
Breach of Arrest or Confinement	20	0	1	11	0	0	0	0	36	0	19	4	56	0	21	3
False Statement or Certificate to obtain Pension	138	0	17	9	75	0	20	8	33	0	4	9	246	0	43	2
Malingering	170	0	37	9	170	0	62	4	0	0	0	0	340	0	100	1
Selling or injuring Arms, &c.	23	0	3	11	19	0	1	8	21	0	4	5	63	0	10	0
Embezzlement	23	0	2	10	0	0	0	0	0	0	0	0	23	0	2	10
Disgraceful Conduct	1701	0	378	0	1207	0	260	2	160	0	30	8	3068	0	668	10
Quitting or Sleeping on post in time of Peace	260	0	63	5	150	0	36	0	20	0	2	0	430	0	101	5
Accepting Bribes to procure Leave, Promotion, &c.	23	0	3	10	25	0	5	9	0	0	0	0	48	0	9	7
Quitting Guard or Picquet in time of Peace	58	0	20	0	22	0	2	7	0	0	0	0	80	0	22	7
Absence from Parade	23	0	3	6	51	0	10	11	44	0	3	9	118	0	18	2
Absence without Leave or Overstaying Leave	510	0	88	10	464	0	108	7	0	0	0	0	974	0	197	5
Absence from Cantonment after hours	43	0	9	0	0	0	0	0	0	0	0	0	43	0	9	0
Wasting Ammunition, &c.	0	0	0	0	0	0	0	0	25	0	8	3	25	0	8	3
Crimes not specified, (to the prejudice of good order, &c.)	3452	0	569	9	2930	6	468	0	891	0	189	4	7273	6	1227	1
Disease	5020	0	980	1	2322	9	432	11	415	6	84	1	7758	3	1497	1
Physical unfitness	2196	0	206	8	1359	0	122	11	898	0	95	3	4453	0	424	10
At his own request	1365	0	335	1	1057	0	232	8	228	0	48	0	2650	0	615	9
Crime or other Cause of discharge not detailed	13844	8	3058	10	10909	5	2539	6	1068	6	274	9	25822	7	5873	1
Total	30290	8	6048	10	22183	8	4833	9	3896	0	781	2	56370	4	11663	9

Average Age and Average Service of the Soldiers discharged the Service.

CAUSES OF DISCHARGE.	Hindoos Age Years	Hindoos Age Months	Hindoos Service Years	Hindoos Service Months	Mahomedans Age Years	Mahomedans Age Months	Mahomedans Service Years	Mahomedans Service Months	Christians Age Years	Christians Age Months	Christians Service Years	Christians Service Months	Total Age Years	Total Age Months	Total Service Years	Total Service Months
Mutiny	26	0	7	6	31	0	14	0	0	0	0	0	30	2	12	11
Violence to Superiors	23	8	6	2	27	4	9	2	0	0	0	0	25	6	7	8
Disobedience of Lawful Command	25	8	7	0	23	6	5	8	28	0	8	5	25	2	6	8
Desertion	21	1	2	11	21	1	2	4	0	0	0	0	21	1	2	0
Drunkenness on Duty	25	9	6	4	21	0	3	1	28	0	8	2	25	5	6	1
Gross insubordination in the Ranks or before a Court Martial	0	0	0	0	26	0	8	8	0	0	0	0	26	0	8	8
Breach of Arrest or Confinement	20	0	1	11	0	0	0	0	36	0	19	4	28	0	10	7
False Statement or Certificate to obtain Pension	23	0	2	11	25	0	6	10	33	0	4	9	24	7	4	3
Malingering	24	3	5	4	28	4	10	4	0	0	0	0	26	1	7	8
Selling or injuring Arms, &c.	23	0	3	11	19	0	1	8	21	0	4	5	21	0	3	4
Embezzlement	23	0	2	10	0	0	0	0	0	0	0	0	23	0	2	10
Disgraceful Conduct	24	7	5	5	23	8	5	1	22	10	4	4	24	1	5	1
Quitting or Sleeping on post in time of Peace	23	7	5	8	25	0	6	0	20	0	2	0	23	10	5	7
Accepting Bribes to procure Leave, Promotion, &c.	23	0	3	10	25	0	5	9	0	0	0	0	24	0	4	9
Quitting Guard or Picquet in time of Peace	29	0	10	0	22	0	2	7	0	0	0	0	26	8	7	6
Absence from Parade	23	0	3	6	25	6	6	5	22	0	1	10	23	7	3	7
Absence without Leave or Overstaying Leave	22	2	3	10	24	5	5	8	0	0	0	0	23	2	4	8
Absence from Cantonment after hours	21	6	4	6	0	0	0	0	0	0	0	0	21	6	4	6
Wasting Ammunition, &c.	0	0	0	0	0	0	0	0	25	0	8	3	25	0	8	3
Crimes not specified, (to the prejudice of good order, &c.)	22	10	3	9	22	6	3	7	22	10	4	10	22	8	3	10
Disease	23	4	4	6	22	6	4	2	20	9	4	2	22	11	4	5
Physical unfitness	19	7	1	10	19	8	1	11	17	11	1	10	19	2	1	10
At his own request	24	9	6	1	23	5	5	2	22	9	4	9	24	1	5	7
Crime or other Cause of discharge not detailed	23	10	5	3	24	0	5	7	24	3	6	2	23	11	5	5
Total	23	4	4	7	23	6	5	1	21	9	4	4	23	3	4	9

E. B.

APPENDIX No. I. *Showing, as per Madras Medical Board's Records, the strength of the Madras Native Army, included in the Medical Returns.*

	Years.	Annual Average Strength.
	1843	74,618
	1844	73,763
	1845	73,577
	1846	74,861
	1847	74,682
Aggregate strength,...	....	371,501
Average strength,...	....	74,300

APPENDIX No. II. *Showing the average Age of the 5th Regiment M. N. I. on the 1st January,* 1848.

Number of each Class.	Designation.	Total Ages.	Average Ages.	
		Years.	Years.	Months.
20	Native Commissioned Officers,..	892	44	7
15	Musicians (Indo Britons,)... ...	367	24	0
8	Drummers, (do. do.)...	200	25	0
9	Fifers, (do. do.)...	220	24	6
2	Buglers, (do. do.)........ ...	61	30	6
13	Lascars, (Natives,).........	397	30	6
796	Fighting Men, (Native Hindoos, Mahomedans, and Christians,)............................	22,958	28	10
Total...868		25,095	28	11

APPENDIX No. III. *Castes of the Madras Native Army, vide Col.* SYKES, *on Vital Statistics, p.* 11.

1837-38.			1838-39.			1839-40.		
Mahomedans.	Other Castes.	Total.	Mahomedans.	Other Castes.	Total.	Mahomedans.	Other Castes.	Total.
18,965	23,190	42,155	19,700	25,231	44,931	20,779	28,741	49,520

E. B.

APPENDIX No. IV. *Showing the average Strength of the Madras Native Army, including all the Natives whose names appear in the Rolls of Discharged Men. From the Office of the Adjutant General of the Madras Army.*

YEARS.	Number of Hindoos.	Number of Mahomedans.	Number of Christians.	Total Number of all Castes.
1842	27,271	19,447	1,908	48,626
1843	20,710	13,935	1,455	36,100
1844	21,781	14,589	1,693	38,063
1845	29,071	18,346	2,471	49,888
1846	27,223	18,252	2,497	47,972
1847	25,764	17,408	2,476	45,648
1848	18,441	13,470	2,125	34,036
Aggregate strength...	170,261	115,447	14,625	300,333
Average strength of the 7 years, - -	24,323	16,492	2,089	42,904

E. B.

VII. Proceedings of the Madras Literary Society and Auxiliary of the Royal Asiatic Society.

At a Meeting of the Managing Committee of the Madras Literary Society and Auxiliary of the Royal Asiatic Society, held at the Club House, on Tuesday, the 1*st August,* 1848, *at* 7 *o'clock* P. M.

PRESENT.

Chairman.

WALTER ELLIOT, Esq.

Members.

Major P. ANSTRUTHER, C. B.
Lieut. Colonel O. FELIX,
Sir H. C. MONTGOMERY, Bart.
J. OUCHTERLONY, Esq.
T. PYCROFT, Esq.
R. H. WILLIAMSON, Esq., and
Captain J. J. LOSH, *Secretary.*

Read draft of revised rules, prepared and circulated since the last monthly Meeting, in conformity with the 1st Resolution thereat.

I. *Resolved,*—That these revised rules be approved, and that 250 copies of them be printed as soon as possible for distribution to Subscribers; also that the rules for the 3rd class subscribers be published in the *Fort Saint George Gazette*, and that the Librarian be instructed to ascertain what would be the charge for publishing them in the principal newspapers at the Presidency.

The following Rules have been established for the guidance of the Madras Literary Society and Auxiliary of the Royal Asiatic Society.

1. The Society is designated the Madras Literary Society and Auxiliary of the Royal Asiatic Society.

2. The Members of the Society consist of two classes, viz.:

Members of the first class, paying a donation of 35 Rupees, and a quarterly subscription of 22 Rupees, who receive in circulation all new Publications, Magazines, &c., and enjoy all the other privileges of the Society.

Members of the second class, paying a donation of 15 Rupees, and a quarterly subscription of 10 Rupees, who are entitled to the use of the museum and the perusal of all stock books in the Library, upon their application for the same.

3. Persons desirous of becoming Members may be admitted to either class at their option on application to the Secretary, accompanied by the recommendation of one Member of the Society in the following form:

I recommend Mr. ———— to be a Member of the Madras Literary Society and Auxiliary of the Royal Asiatic Society of the ——— class.

4. The Officers belonging to the garrison of Madras, and other persons not permanently stationed or resident at the Presidency, may become Members of the Society, and be entitled to all the privileges of Members of the 2nd class, without paying donation.

5. The quarters are considered as commencing on the 1st of January, April, July, and October, respectively—a new Member admitted in the first month of the quarter is required to pay the whole subscription, in the second month two-thirds, and in the third month, one-third of the subscription for the current quarter. Members absent from the Presidency on duty or otherwise are exempted from subscription.

6. The management of the affairs of the Society is vested in eleven Members, severally chosen at the Annual General Meeting of the Society, who, together with the Secretary, form the General Committee of Management.

7. The General Committee of Management elect their own Chairman, who is ex-officio a Member of all Sub-Committees.

8. The Secretary is appointed by the General Committee of Management, subject to the approval of the President of the Society.

9. All vacancies, permanent or temporary, in the Committee of Management, occurring in the course of the current year, may be filled up by the Committee.

10. Any Member of the Committee of Management who, without satisfactory reason assigned, absents himself from three successive monthly Meetings of the Committee, is held thereby to have ceased to belong to the Committee, which will proceed accordingly to supply his place, in accordance with Rule 9.

11. The whole of the funds of the Society are subject to the control of the General Committee of Management, and all donations and subscriptions form one fund, to be appropriated for the general purposes of the Society.

12. The duties formerly conducted by the Committee of papers of the Asiatic department are now entrusted to a Sub-Committee elected from the Members of the General Committee of Management.

13. A General Meeting of the Society is held annually, as soon as possible after the Society's accounts for the preceding year have been closed and passed by the managing Committee, and statements of them prepared for submission to the General Meeting.

14. Under the 3rd and 4th Resolutions passed by the Anniversary Meeting of the Royal Asiatic Society, held on the 14th March, 1829, Members of both classes of the Madras Literary Society and Auxiliary of the Royal Asiatic Society, while residing in Asia, are non-resident Members of the Royal Asiatic Society, and when in Europe may be elected resident Members, in the same manner that honorary Members are elected; and Members of the Royal Asiatic Society while residing in Europe are non-resident Members of the Madras Literary Society and Auxiliary of the Royal Asiatic Society, but when within the Presidency of Madras may be elected resident Members, in the manner prescribed by the regulations of the Madras Literary Society and Auxiliary of the Royal Asiatic Society.

Rules for the Library of the Society, applicable to Members of the Society subscribing in the 1st and 2nd classes.

1. The Library is open to all Members of the Society, who are entitled to the use of the stock books, and of the new publications as they are received from England, subject to the rules and regulations hereafter prescribed.

2. A catalogue of the books in the Library is printed when necessary, for the use of the resident Members.

3. Any person who may lose or seriously injure a book is required to pay for the whole work, at the price marked in the catalogue kept at the Library.

4. On the arrival of new books from England, a printed list of them is furnished to each Member of the first class, the day on which the circulation is to commence being notified thereon.

5. Any such Members desirous of reading any of the books in the list, is to send a note to that effect to the Librarian, not later than the day previous to the day of circulation.

6. The time limited for the reading of all new books is determined by the Secretary, according to the nature of the work, and is marked on the cover, and each Member is to return the book at the expiration of the limited time, to the Library, when it will be forwarded to the person whose name is next on the list and so on in rotation.

7. The names of persons who are irregular in returning books to the Library at the expiration of the time allowed for their perusal are to be reported by the Librarian to the Committee, and their names put at the bottom of the lists at the discretion of the latter.

8. Reviews and Magazines are, immediately on their arrival, to be sent in circulation to Members of the first class, who are disposed into divisions, according to residence and to the number of copies received.

9. The Librarian keeps a register to enter the application of Members for books, which are accordingly furnished immediately, if in the Library; but if the books applied for be in circulation, or in use by other Members, they are to be forwarded to the persons applying, when returned to the Library at the expiration of the time limited for the perusal of them.

10. With regard to the stock books of the Library, the following periods are allowed for their detention by the Members, viz., six days for a Duodecimo volume, ten days for an Octavo, sixteen days for a Quarto, and twenty-four days for a Folio, at the expiration of which time if any other Member has applied for the book, it is to be returned or re-called; but if no other Member has applied for it, the book may be allowed to remain a further time with the person reading it.

11. No Member is allowed to take more than two works from the Library at the same time, except on countersignature of a Member of the Managing Committee; and this rule is to be strictly and peremptorily enforced.

12. No manuscripts belonging to the Society can be taken out of the Library without the especial permission of the Managing Committee.

13. All stock books issued from the Library are requested to be returned on the 1st January, and the 1st of July, in each year, and are not to be demanded for three days afterwards to admit of their being compared with the catalogue.

Rules for the Library of the Society, applicable to Subscribers of the 3rd Class.

At the annual General Meeting held on the 27th March, 1848, it was proposed "that steps be taken to render the Society's Library more available than it has hitherto been to the public at large, by throwing it open to a third class of subscribers, each of whom will be allowed to carry out a single work at a time on lodging a small deposit with the Librarian, on terms similar to those observed in the public Libraries at Calcutta and the Cape of Good Hope," which proposition was approved of, and the Committee of management were authorised to adopt measures for carrying it into effect. In pursuance of the above resolution, the following Rules have been established, and have effect from the 1st October, 1848.

3rd Class.

The use of a portion of the stock books of the Library shall be open to persons not Members of the Society on the following conditions:

1. The third class of subscribers consists of persons subscribing one Rupee per mensem each. A subscriber of the third class may take out of the Library any of the works available to that class, if not comprising more than three (or if a novel more than five) volumes. Of other works not more than two volumes can be taken out at one time.

2. Every subscriber of the 3rd class before receiving books from the Library is required to lodge a deposit of 20 Rupees with the Librarian, one half in cash and the residue by a promissory note, and such deposit shall be applicable to the discharge of all claims by the Society upon such subscriber.

3. Applications for books must be made by subscribers in person or by written orders signed by such subscribers, and sent by a person provided with a bag or box for the conveyance and security of the books, which shall also be returned with similar precaution.

4. Subscribers of the 3rd class are allowed to keep books for the following periods:

Octavo volumes, - - - - -	a week,
Quarto do. - - - - -	2 weeks,
Folio do. - - - - -	3 weeks.

Exclusive of the day of delivery.

5. On the expiration of the above periods the books must be returned to the Library by the party who took them, in failure of which he shall be subject, at the discretion of the Committee, to a fine not exceeding one anna a day, chargeable on his deposit for the time of detention in excess of the regulated period.

6. Any 3rd class subscriber failing to return a book within three months is required to provide another complete copy of the work, for which his deposit will be held responsible.

7. The return of any book in a damaged state is to be reported to the Committee, who shall determine the penalty to be exacted.

8. Any subscriber taking out a book in a damaged state, and not giving notice of the same to the Librarian, shall be held accountable for it.

9. Any subscriber lending a book taken out by him shall incur a fine to be fixed by the Committee.

10. Notice shall be given to any subscriber of any fine or penalty incurred by him, and the amount, if not paid, shall be deducted from his deposit, and no book issued to him until the deposit be again completed.

11. Subscriptions must be paid monthly to the Librarian by the parties themselves. No books will be issued to subscribers in arrears.

12. Subscribers desiring to withdraw shall receive back their deposit by and under an order of the Committee.

MEMO.

At General Bishop's sale I bought for 106 Rupees a very fine copy of Rees's Cyclopedia, capitally bound and quite as good as new.

I offer it to the Literary Society for the same price which is less than half its London price at present.

(Signed) C. P. BROWN,
28th July, 1848.

Mr. Brown sends Mr. Bantleman 3 volumes of Rees's and wishes them to be laid before the Meeting on Tuesday.

Saturday, 29th July.

They should be kept in this box.

Read Memoranda from C. P. Brown, Esq., offering to the Literary Society for the same price at which he purchased it, viz., 106 Rupees, a copy of Rees's Cyclopedia, and sending 3 volumes of the work to be laid before the Meeting.

II. *Resolved*,—That Mr. Brown be thanked for his offer; which however, in consideration of the present state of the funds of the Society, and the number of similar works already in the Library, the Committee feel themselves under the necessity of declining.

Read letter from the Chief Secretary to Government, transmitting, by order of Government, one copy of a work for determining the time, recently published at the Presidency.

FORT ST. GEORGE, *6th July*, 1848.

No. 48.

PUBLIC DEPARTMENT.

GENTLEMEN,

I am directed by the Right Honorable the Governor in Council to transmit to you one copy of a work for determining the time, just published at the Presidency.

I have the honor to be,

Gentlemen,

Your most obedient Servant,

(Signed) J. F. THOMAS,

Chief Secretary.

To

The Committee of the Madras Literary Society and Auxiliary of the Royal Asiatic Society.

The work in question, and also the* transactions of the Bombay Geographical Society from January 1847 to April 1848, and† Nos. 5 and 6 of volume 2d, and Supplement to No. 6 of volume 1st of the Journal of the Indian Archipelago and Eastern Asia, presented to the Society since the last Meeting, are laid before the Meeting.

* Presented by the Bombay Geographical Society.

† Presented by J. R. Logan, Esq., Singapore.

III. *Resolved,*—That these publications be deposited in the Library.

Read letter from Messrs. Wm. H. Allen and Co., dated 19th June, 1848, advising the despatch of periodicals and of books per Steamer, and stating that they have been obliged to subscribe to the Hakluyt Society for the purpose of obtaining a copy of Hawkins's South Sea Voyages, and requesting to be informed if the subscription is to be continued.

IV. *Resolved,*—That the receipt of this letter be acknowledged, and that Messrs. Allen and Co. be requested to continue to subscribe to the Hakluyt Society on account of the Madras Literary Society. Also that the receipt of the books and periodicals in question be acknowledged, as soon as it is ascertained that they have arrived, and that the following works be ordered out for the use of the Society :

The Fairfax Correspondence.

Japan and Japanese, post octavo.

Histoire des Cagots on races proscrits en France and Espagne, par M. Michel.

Physical Atlas of Natural Phenomena, by A. K. Johnston, F. R. G. S.

Analogies and Contrasts or Comparative Sketches of France and England, by the author of "Recollections of Russia."

Resolved, further,—At the suggestion of Major Anstruther, C. B., that copies of two translations by Major Begbie, of the Madras Artillery, recently published at the Presidency, be purchased on account of the Society, and, at the suggestion of Walter Elliot, Esq., that a copy of Bird on the Jains and Buddhists, published at Bombay, be obtained by the first opportunity.

(Signed) WALTER ELLIOT,
Chairman.

(Signed) J. J. LOSH,
Secretary M. L. S. &c.

At a Meeting of the Managing Committee of the Madras Literary Society and Auxiliary of the Royal Asiatic Society, held at the Club House, on Tuesday, the 5th September, 1848, *at 7 o'clock* P. M.

PRESENT.

Chairman.

WALTER ELLIOT, Esq.

Members.

Major R. GARSTIN,
W. A. MOREHEAD, Esq.
Lieut. Col. T. S. PRATT, C. B.
T. PYCROFT, Esq.
R. H. WILLIAMSON, Esq. and

Captain J. J. LOSH, *Secretary*.

Read note, to the address of the Secretary, from Surgeon MacGregor, H. M. 25th Regiment, enclosing a notice respecting a work offered for sale to the Society.

MADRAS, 29*th August*, 1848.

SIR,

The accompanying notice of a work for sale was sent me by Lieut. Halsted, Cannanore, for submission through you to the Madras Literary Society. I shall feel obliged by your laying the matter before the Committee.

Your's very faithfully,

(Signed) J. MACGREGOR,
Surgeon 25*th Regiment*.

FOR SALE AT CANNANORE.

Plans, Elevations, Sections and Details of the Moorish palace at Grenada in Spain called " Alhambra," as taken by M. Jules Goury and Owen Jones, Architects, a magnificent architectural work, super-extra bound in green morocco and gilt edges, royal folio, two volumes in one, ... Rs. 300

I. *Resolved*,—That Surgeon MacGregor be informed that the Managing Committee, while thankful for the offer of the valuable work in question, are precluded from accepting it in consequence of the present condition of the funds of the Society.

MEMO.

The 9th volume of Strickland's Lives of the Queens of England has been lost by J. H. Wilkins, Esq.

Blackwood's Magazine, vol. 50, and Love and Pride, a Novel in 3 vols., taken from the Library by Lieut. H. H. Pratt, H. M. 94th Regiment, have not been returned. The former he said was by mistake taken on to Cannanore and that it would be returned.

Robison's History of Free Masonry, taken from the Library by Captain Seale, H. M. 94th Regiment, has not been returned.

Read Memorandum from the Librarian respecting certain books belonging to the Library which have been lost or not returned by Subscribers.

II. *Resolved,*—That, unless the books in question are returned to the Library before the next monthly Meeting of the Committee, the parties concerned be called upon either to replace or pay for them in conformity with the rules.

Read letters from Messrs. William H. Allen and Co., dated 27th June and 19th July, 1848, the former advising the despatch of books, &c., per *Barham*, and the latter of books and periodicals per Steamer.

III. *Resolved,*—That the receipt of Messrs. Allen and Co.'s letters be acknowledged, and that they be requested to send out the following books for the use of the Society.

The Isle of Man: its History, &c. &c., by the Rev. J. G. Cumming, M. A. F. G. S.

Captain de la Graviere's Sketches of the last Naval War, translated by the Hon. Captain Plunkett, R. N., 2 vols.

Supplement to Burke's History of the Landed Gentry of England, Scotland, and Ireland.

Hand Book of Painting in Spain, by Sir T. Head.

Quatremore de Quinecy's Histoire de Michael Angel Buonarotti.

Do. do. Histoire de la vie et des Ouvres de Raphael d'Urbino.

The Life of Leonardo du Vinci, London. 1828.

Vasaris' History of the Early Painters, Sculptors and Architects, (English Translation.)

MEMO.

Subscriptions to the Journal Nos. 30 and 31 have been received from the following gentlemen since the monthly Meeting of the Committee held on the 6th June, 1848.

R. Alexander, Esq., No. 31...	2 0 0
Chungra Warrier, Esq., 2 copies Nos. 30 and 31............	8 0 0
Messrs. Pharoah and Co., Nos. 30 and 31..................	4 0 0
Rupees...	14 0 0

In conformity with the 7th Resolution at the Meeting on the 8th December, 1846, a memorandum of the sums received on account of subscriptions to Nos. 30 and 31 of the Society's Journal since the Meeting of the 6th June, 1848, is laid on the table.

IV. *Resolved,*—That this Memorandum be recorded.

With reference to the 1st Resolution at the last monthly Meeting, the Committee are of opinion that it will not be necessary to publish the rules for the 3d class subscribers in any newspaper except the *Fort St. George Gazette.*

V. *Resolved*,—That the Editors of the *Spectator*, *Athenæum*, *Crescent*, *United Service Gazette*, and *Circulator* be each furnished with a copy of the revised rules of the Society, with an intimation that the rules for the 3d class of Subscribers are entirely new.

(Signed) WALTER ELLIOT, *Chairman.* (Signed) J. J. LOSH, *Secretary M. L. S. &c.*

At a Meeting of the Managing Committee of the Madras Literary Society and Auxiliary of the Royal Asiatic Society, held at the Club House, on Tuesday, the 3d October, 1848, *at* 7 *o'clock*, P. M.

PRESENT.

Chairman.

WALTER ELLIOT, Esq.

Members.

Major P. ANSTRUTHER, C. B.
Lieut. Colonel O. FELIX,
Major R. GARSTIN,
J. OUCHTERLONY, Esq.
T. PYCROFT, Esq.
R. H. WILLIAMSON, Esq., and
Captain J. J. LOSH, *Secretary.*

Read letter from the Secretary to the Board of Revenue in the Department of Public Works, dated 21st September, 1848, No. 729, forwarding copy of a letter which the Board propose to address to Government upon the subject of the formation of a central Museum of Economic Geology at the Presidency should the other public bodies with whom they have been directed to act in concert, concur therein.

DEPARTMENT OF PUBLIC WORKS.

MADRAS, 21*st September*, 1848.

No. 729.

From Captain J. H. BELL,
Secretary to the Board of Revenue in the Department of Public Works.

To the Secretary to the Literary Society.

SIR,

I am directed by the Board of Revenue, with reference to the order
August 4th 1846, No. 726. of Government upon the subject of the formation of a central Museum of Economic Geology at the Presi-

dency, to forward copy of a letter which they propose to submit to Government, should the other public bodies with whom they have been directed to act in concert concur therein.

The Board therefore request you will be pleased to inform them of the sentiments of the Literary Society on the subject.

I have the honor to be,

Sir,

Your most obedient Servant,

(Signed) J. H. Bell,

Secretary Board of Revenue Dep. P. W.

To the Secretary to the Literary Society.

To the Chief Secretary to Government.

Sir,

I am directed by the Board of Revenue with reference to the order of Government as per margin, to observe that they have since been favored with a copy of the letter addressed to Government by the Managing Committee of the Madras Literary Society upon the subject of the proposed central Museum.

August 4th, 1846. No. 726. November 16th, 1846.

In the propositions generally of the Literary Society the Board concur, and they now consider it necessary again to solicit the attention of Government to the subject, and to recommend that early measures may be taken for the provision of a suitable building and a qualified Curator for the Museum, which would doubtless, if once thus established under skilful management, be filled with objects necessary for the study of the sciences and useful arts.

I have, &c.

(Signed) J. H. Bell,

Secy. Board of Revenue D. P. W.

(True copy.)

(Signed) J. H. Bell,

Secy. Board of Revenue D. P. W.

I. *Resolved*,—That the Revenue Board be informed, in reply, that the Managing Committee approve of, and fully concur in the application which the Board propose to submit to Government.

Read letter from the Librarian Calcutta Public Library acknowledging the receipt of certain numbers of the Madras Journal of Literature,

and returning the best acknowledgments of the Curators of the above institution to the Madras Literary Society for the donation.

To the Secretary to the Madras Literary Society.

Sir,

I beg to acknowledge your letter under date the 30th June last, advising of the transmission per "*Precursor*" of a parcel containing Nos. 2 to 5 of the Madras Journal of Literature, which have come to hand. I have also been favored with No. 33 of the publication in question, and for these kind acts on the part of the Society I beg you will be good enough to convey to it the best acknowledgments of the Curators of this institution.

I have the honor to be, &c. &c.

(Signed) Peary Chand Mittra, *Librarian, Calcutta Public Library.*

Metcalfe Hall,
1*st September*, 1848.

II. *Resolved*,—That this letter be recorded.

Read Memorandum from C. P. Brown, Esq., forwarding a printed list of books offered for sale and recommending the Society to purchase one complete set.

III. *Resolved*,—That it does not appear advisable to purchase duplicates of works already in the Library, and that therefore the Librarian be requested to mark such works as the Society is already provided with in the list, after which the Committee will consider if it be expedient to purchase the others, or any of them.

Read letters from two Subscribers respecting works belonging to the Library which have not been returned by them and for which they are willing to pay.

11*th September*, 1848.

Mr. McTaggart regrets to inform Mr. Bantleman that Corinne on Italy, by Made. de Stael, has been taken out of his house by some guest and that consequently he must pay the cost of the work.

19*th September*, 1848.

Lieut. Colonel Forster begs to acknowledge the Librarian's note, relative to Drury's Poems, &c. &c.

Lieut. Colonel Forster perfectly recollects the book in question being amongst others at his house, and he certainly thought it had been returned especially with reference to the period which has elapsed since it was with him.

If however the Librarian is *quite certain* that the book was not returned or in usual course sent to other Subscribers, *then* Lieut. Colonel Forster will be prepared to pay the value of it, as he regrets that after a diligent search it is no where to be found.

IV. *Resolved*,—That W. McTaggart, Esq., and Lieut. Colonel Forster be called upon to pay for the works in question.

Read letter from Messrs. Wm. H. Allen and Co., dated 19th August, 1848, advising the despatch of periodicals and books per Steamer.

V. *Resolved*,—That the receipt of Messrs. Allen and Co.'s letter, and of the periodicals and books alluded to, be acknowledged, and that they be requested to send out the following books for the use of the Society.

Collection of Treaties and Engagements with Native Princes and States of Asia, published in 1812.
Memoirs and Correspondence of Viscount Castlereagh, second Marquis of Londonderry, 4 vols.
} To be sent out by Steamer.

Resolved, further,—That Messrs. Allen and Co. be reminded that they have not yet sent out "Marsden's Travels of Marco Polo," which work was ordered in the beginning of 1844, and is still required, and that they be directed to discontinue sending out Ainsworth's and Hood's Magazines and the Christian Observer, and informed that one of the numbers of the United Service Journal for June, 1848, sent out by them is incomplete, pages 193 to 208 being missing, and other superfluous pages inserted instead.

Read Memorandum from Major P. Anstruther, C. B.

I think Colonel Pratt says we ought to have Jomini, Traitè des Grandes Operations Militaires, 11 vols. If so the Society may have a copy, (I have two)—at a valuation.

(Signed) P. Anstruther.

VI. *Resolved*,—That Major Anstruther be requested to send the copy of the work in question which he is willing to dispose of for the inspection of the Managing Committee at their next monthly Meeting, with a memorandum showing the price at which it is valued by him.

Memo.

Subscriptions to the Journal Nos. 30 and 31 have been received from the following Gentlemen since the monthly Meeting of the Committee held on the 5th September, 1848.

R. D. Parker, Esq., Nos. 30 and 31, Rupees 4-0-0.

In conformity with the 7th Resolution at the Meeting on the 8th December, 1846, a Memorandum of the sums received on account of subscriptions to Nos. 30 and 31 of the Society's Jour-

nal since the Meeting of the 5th September, 1848, is laid on the table.

VII. *Resolved*,—That this Memorandum be recorded.

(Signed) WALTER ELLIOT, *Chairman.* (Signed) J. J. LOSH, *Secretary M. L. S. &c.*

At a Meeting of the Managing Committee of the Madras Literary Society and Auxiliary of the Royal Asiatic Society, held at the Club House, on Tuesday the 7th November, 1848, *at 7 o'clock* P. M.

PRESENT.

Chairman.

WALTER ELLIOT, Esq.

Members.

Lieut. Colonel O. FELIX,
Sir H. C. MONTGOMERY, Bart.
J. OUCHTERLONY, Esq.
Lieut. Colonel T. S. PRATT, C. B.
R. H. WILLIAMSON, Esq., and
Captain J. J. LOSH, *Secretary.*

The Secretary having brought to the notice of the Meeting that there are still much difficulty and delay in collecting sums due on account of the Society's Journal from Subscribers at out-stations, and that the arrangement which it was expected would be effected for making the collections in question by the aid of the Post Office Writers has not been found practicable ; at the suggestion of the Chairman, it is

I. *Resolved*,—That a letter, as per margin, be addressed to Government, and in the event of a favorable answer being received, that the bills for each number of the Journal be put up and transmitted with the publication itself; each bill being prepared in the name of the nearest Collector or Military Paymaster, to whom the Secretary will, at the same time

To the Chief Secretary to Government.

SIR,

I have the honor, by desire of the Committee of Management of the Madras Literary Society and Auxiliary of the Royal Asiatic Society, to request you will do them the favor to ascertain whether there will be any objection on the part of the Government to authorize Collectors and Paymasters at the several out-stations to receive and transmit the payments on account of the Madras Journal of Literature and Science, due by Subscribers in the interior. The trifling cost of each number of that publication renders the collection of so many small sums in the ordinary manner a matter of great difficulty, and as the Government have been pleased to extend a large measure of their patronage to the Journal and to authorize the publication in it of papers connected with the public records, the Committee trust that it may not be considered in-

expedient to permit the same arrangement to be extended to its Subscriptions as exists with regard to the Government Gazette.

address a communication by letter containing a list of the claims so referred to him.

With reference to the 3d Resolution at the last monthly Meeting, the Committee proceed to take into consideration the expediency of making purchases of the books included in the printed list forwarded by Mr. C. P. Brown with his Memo. dated 11th September last.

II. *Resolved,*—That it is inexpedient to purchase the works in question particularly as it appears that many of them are already in the Library.

Read letter from Captain T. J. Newbold, offering to the Society specimens of Rocks and Fossils.

To the Secretary Madras Branch Royal Asiatic Society.

Sir;

I do myself the pleasure of offering to the Society the accompanying specimens of the Rocks and Fossils of the Chikuldap Hills in H. H. the Nizam's territories.

I have the honor to be,
Sir,
Your most obedient Servant,
(Signed) T. J. Newbold,
Captain 23d M. Light Infantry.

III. *Resolved,*—That the specimens of Rocks and Fossils be accepted and deposited in the Museum, and that the best thanks of the Committee on behalf of the Society, be offered to Captain Newbold for his valuable present.

Memorandum
For circulation to the Literary Society Committee.

More than three years have elapsed since I presented to Government my Library of Manuscripts in Sanscrit, Telugu and other languages.

These books were deposited by me in the Madras College Library and there they still remain. To this day I have received no document from Government acknowledging the gift.

The books have been placed under the charge of the Literary Society. The event has proved me correct in thinking this injudicious. The collection ought to have been placed under the care of the College Board, unless a separate Curator should be appointed. At present no individual is answerable for the books, and were I once out of the way the entire collection would

Read Memorandum from C. P. Brown, Esq.

* The Committee observe that when, by Extract from Minutes of Consultation in the Public Department, dated 5th February, 1847, No. 124, Government permitted the collections of Native books and manuscripts in charge of the Literary Society to be transferred to the College Board, the proposed arrangement was postponed at the particular request of Mr. Brown himself.

IV. *Resolved,*—That as soon as the examination and classification of the books

be at the mercy of any Native who thought it worth while to bribe the Librarians who are common Native scribes.

I wish this memorandum to appear in the next number of the Journal, to show the uselessness of attaching this manuscript collection to the Literary Society, and to suggest the necessity of placing the manuscripts in charge of some responsible person.

(Signed) C. P. Brown.

Madras, 7th Oct. 1848.

and manuscripts in question now in progress is completed, the subject of Mr. Brown's Memorandum be again taken into consideration.

Memorandum.

Without returning the undermentioned works belonging to the Society's Library, R. S. Ellis, Esq., went home by the last Steamer on the 15th October, 1848.

The Crescent and the Cross, 2 vols.
The Fallacies of the Faculty.

Read Memorandum from the Librarian respecting certain works not returned to the Library by Mr. R. S. Ellis, who has proceeded to England.

V. *Resolved*,—That, on his return to India, Mr. Ellis be called upon to pay for the works in question, should they not be returned to the Library in the mean time.

Mr. Bantleman,

I send the book I offered to sell, I think it is worth 40 Rupees, as I see it is 15 volumes besides the Atlas.

If the Society purchases it, be so good as give me credit for the amount as I am in arrears.

Your's, &c.
(Signed) P. Anstruther.
24th Oct. 1848.

Memo.

Arrears of subscription due by Major P. Anstruther, C. B., to the Society are Rupees 64 0 0

Read Memorandum from Major P. Anstruther, C. B., offering, with reference to the 6th Resolution at the last monthly Meeting, for sale to the Society, a copy of Jomini's Traité des Grandes Operations Militaire, in 15 volumes, with a large Atlas, for 40 Rupees.

VI. *Resolved*,—That the work in question be purchased for the Society, and that, in compliance with Major Anstruther's request, the price of it be placed to his credit in part payment of arrears of subscription due by him.

Fort St. George, 18*th Oct.* 1848.
No. 946.
Public Department.

Gentlemen,

With reference to Para. 2 of Extract from Minutes of Consultation, dated 5th February last, No. 129, I am directed by the Right Honorable the Governor in Council to request to be furnished, at an early date, with the quarterly reports required by the Honorable Court, of the number of Oriental manuscripts now in your charge, which have been examined and classed.

I have the honor to be, &c. &c.
(Signed) J. F. Thomas,
Chief Secretary.

To
The Committee of the Madras Literary Society and Auxiliary of the Royal Asiatic Society.

Read letter from the Chief Secretary to Government requesting to be furnished with the quarterly reports required by the Honorable the Court of Directors of the number of Oriental manuscripts in charge of the Society which have been examined and classified, letter from the Chairman of the Committee reporting progress, and draft of letter from the Secretary forwarding a copy of the letter for the information of Government, all of which have been circulated since the last Meeting.

VII. *Resolved*,—That this subject does not require further consideration at present.

From WALTER ELLIOT, *Esq.*

To Captain LOSH,

Secretary to the Literary Society.

SIR,

I beg to inform you, with reference to the letter of the Chief Secretary to Government in the Public Department, No. 946, dated 18th Instant, in which the Committee of the Literary Society are requested to furnish the quarterly reports required by the Honorable the Court of Directors of the number of Oriental MSS. in charge of the Society which have been examined and classified, that it has not, up to this time, been found possible to procure the services of an adequately qualified Superintendent, as proposed in the report of the Sub-Committee, dated 5th June, 1846. But in order that the wishes of the Honorable Court might not be altogether disappointed, I have myself, as my time permitted, conducted an examination and analysis of the MSS., the results of which are exhibited in the following tabular statement:

	Number of MSS.			Of which Abstracted and Classified.			Remain.		
	Cadjan	Paper	Total.	Cadjan	Paper	Total.	Cadjan	Paper	Total.
Sanscrit, ...	805	534	1,339	765	37	802	40	497	537
Telugu,.......	712	452	1,164	243	0	243	469	452	921
Canarese,......	0	22	22	0	0	0	0	22	22
Tamil,..........	14	0	14	0	0	0	14	0	14
Malayalem,...	3	0	3	0	0	0	3	0	3
Burma,........	21	0	21	0	0	0	21	0	21
Total...	1,555	1,008	2,563	1,008	37	1,045	547	971	1,518

I may add that this has been accomplished without incurring any extra expense, by means of my establishment as Canarese Translator to Government, and with the occasional aid of such of the College Moonshees as happened from time to time, to be unemployed by the Junior Civil Servants studying in the Institution. The progress of the examination has necessarily, under such circumstances, been slow; but

considerable progress has been made, and the whole may be expected to be completed at no distant period.

I have the honor to be, &c. &c.

(Signed) Walter Elliot,
Chairman Lit. Socy. Committee.

Fort St. George,
26*th October*, 1848.

To Captain Losh,
Secretary to the Literary Society.

To The Chief Secretary to Government,
Fort St. George.

Sir,

1. I have the honor, by desire of the Managing Committee of the Madras Literary Society and Auxiliary of the Royal Asiatic Society, to acknowledge the receipt of your letter* to their address, dated 18th Instant, No. 946, and, in advertence to the subject thereof, to annex for the information of the Right Honorable the Governor in Council copy of a letter* from their Chairman, from which it will be perceived that they have not yet been able to effect the arrangement sanctioned by the Honorable the Court of Directors in the 2d paragraph of their letter* to Government, dated 21st December, 1847, in supersession of that made under the† authority of the Government of India, dated 19th July, 1845, which latter, consequently, remains undisturbed.

* Public Department.

* Dated 26th October, 1848.

* Recorded in Extract from the Minutes of Consultation in the Public Department, 5th February, 1848, No. 129.

† Letter from the Secretary to the Government of India, No. 490, recorded in Extract from Minutes of Consultation in the Public Department, dated 15th August, 1845, No. 737.

2. The Committee propose, on the completion of the examination and classification of the manuscripts to submit a full and detailed report respecting them, for the information of the Right Honorable the Governor in Council, and the Honorable the Court of Directors.

I have the honor to be, &c. &c.

(Signed) J. J. Losh,
Secretary M. L S. &c.

Literary Society, College,
31*st October*, 1848.

Read letters from Messrs. Wm. H. Allen and Co., dated 8th and 19th September, 1848, the former admitting the despatch of books per *Devonshire* and the latter of books and periodicals per Steamer.

VIII. *Resolved,*—That the receipt of Messrs. Allen and Co.'s letters be acknowledged, and that they be requested to send out the following books for the use of the Society.

To be sent out by Steamer:

- History of England from the Accession of James II., by T. B. Macaulay.
- Translation of the Book of Enoch, by Laurence.
- The History of the Dodo, by Strickland.
- An Account of the Ionic Trophy Monument from Xanthus, by Sir C. Fellowes.
- Presbytery Examined, by the Duke of Argyll.
- Dog Breaking, by Lieut. Col. W. N. Hutchinson.
- Pictures from the North, by G. F. Atkinson, Esq., Bengal Engineers.
- Affection, its Flowers and Fruits, a Tale of the Times.
- Field Sports in the United States and British Provinces of America, by Frank Forester.
- The Two Baronesses, by H. C. Anderson.

(Signed) Walter Elliot, *Chairman.*

(Signed) J. J. Losh, *Secretary M. L. S. &c.*

At a Meeting of the Managing Committee of the Madras Literary Society and Auxiliary of the Royal Asiatic Society, held at the Club House, on Tuesday, the 5th December, 1848, at 7 o'clock P. M.

PRESENT.

Chairman.

Walter Elliot, Esq.

Members.

C. P. Brown, Esq.
Sir H. C. Montgomery, Bart.
W. A. Morehead, Esq.
J. Ouchterlony, Esq.
T. Pycroft, Esq.
R. H. Williamson, Esq., and
Captain J. J. Losh, *Secretary.*

The Secretary reports that there are now funds sufficient to discharge the bill of the Superintendent of the Christian Knowledge Society's Press for printing the 33rd Number of the Society's Journal.

I. *Resolved,*—That the Superintendent of the Christian Knowledge Society's Press be informed that his bill, amounting to Rupees 487-9-7

will be paid when presented for payment in the course of the present month.

Read letter from Messrs. William H. Allen and Co. dated 19th October, 1848, advising the despatch of periodicals and books per Steamer.

II. *Resolved,*—That the receipt of Messrs. Allen and Co.'s letter, and of the periodicals and books alluded to be acknowledged, and that they be requested to send out the following books for the use of the Society.

Smith's Dictionary of Greek and Roman Antiquities.
The Jesuit Conspiracy. The secret plan of the order detected and revealed, by the Abbate Leone.
Six Weeks in Corsica, by W. Carnin, Esq.
Travels in Sardinia, by J. W. W. Tyndale, M. A.
Vicissitudes of the Eternal City, by J. Whiteside, A. M.
A Campaign in New Mexico with Colonel Doniphan, by F. S. Edwards, a Volunteer.
(Pamphlet) Letter to the Marquis of Lansdowne, by Lord Brougham.
Charles de Montford, a French Novel printed about 1805.
Cumberland's Novels: namely, Arundal, Henry, and John de Lancaster.
The Reformation and Anti-Reformation in Bohemia, (English Translation.

} To be sent out by Steamer.

(Signed) Walter Elliot, *Chairman.*

(Signed) J. J. Losh, *Secretary M. L. S. &c.*